THE ELECTRICAL WORLD
A Weekly Review of Current Progress in Electricity and its Principal Applications

PUBLISHED EVERY SATURDAY

AT NO. 9 MURRAY STREET, NEW YORK.

Telephone Call: Murray 586. Cable Address: "Electrical," New York.

New England Office, 48 Congress Street, Boston.
Western Office, 23 Borden Block, Chicago.

W. J. JOHNSTON, Editor and Publisher.

T. COMMERFORD MARTIN, JOSEPH WETZLER, Associate Editors.

E. P. THOMPSON, Associate Editor Patent Department.

CLARENCE E. STUMP, Business Manager.

SUBSCRIPTION, IN ADVANCE, ONE YEAR, $3.00.

(Postage Prepaid in the U. S. or Canada.)

CLUBS.—In clubs of 4 or more, $2.50 a year each; with a free extra copy to the getter-up of a club of 8. Subscription to foreign countries, $4 a year.

In requesting your address changed, give old as well as new address.

THE ELECTRICAL WORLD HAS THE LARGEST CIRCULATION OF ANY ELECTRICAL JOURNAL PUBLISHED, AND IS THE BEST ADVERTISING MEDIUM.

Advertising Rates are much lower than those of any other similar publication, circulation and standing considered, and vary according to space, position and number of insertions.

Notices of Situations or Help Wanted, $1 to $3 an issue.

Correspondence, views and opinions on all topics within the province of this journal are cordially invited from any part of the world. We will thank readers to forward to us—promptly as they occur—Items of News, or information relating to any application of electricity, also marked copies of their local papers containing anything likely to interest electricians. Anonymous communications cannot be noticed, nor can rejected manuscript be returned, unless accompanied by the necessary postage when received.

Matter for the Editorial Department should be addressed to

The Editor of The Electrical World, New York.

Subscriptions and communications relating to Advertising or the Business Department should be addressed simply,

THE ELECTRICAL WORLD, New York,

Or, when more convenient, they can be sent to the Chicago office.

CONTENTS.

ILLUSTRATED ARTICLES:	PAGE.
Handy Testing Set	252
A New Oscillating Engine for Electric Lighting	253
The Electric Aurophone	254
Charging Secondary Batteries	255
Physician's Cabinet Battery	257
A Lathe for the Electrical Workshop	257
EDITORIAL PARAGRAPHS	251
MISCELLANEOUS:	
A New and Important Application of Electricity	252
Removal of the Brush-Swan Company	252
Electrical Nomenclature and Notation	252
Recovery from Alleged Severe Electric Shocks	252
A Model Telephone Exchange	253
New York Electrical Society	253
A Constant Cell	253
Tropical Telephone Finances	253
The Association of Railway Telegraph Superintendents	254
Lightning Rods for Oil Tanks	254
The Electric Light on the Pennsylvania Railroad	254

MISCELLANEOUS:	PAGE.
Suing the Telegraph Companies for Cheap Work	254
Erie Telegraph and Telephone Company	254
Lady Aylmer	255
Static Electricity (Continued)	256
Gen. Grant and the Military Telegraphers	256
Systems of Communication	256
God's Electric Light (Poem)	257
An Operator's Speculation in Hair	257
A Telegrapher's Conscience Money	257
Another Story about Gen. Stager	257
THE ELECTRICAL WORLD Pedestal Fund	257
A Big Electric Organ	257
DEPARTMENTS:	
New England Notes	258
Western Notes	258
The Telegraph	258
The Telephone	259
The Electric Light	259
Miscellaneous Notes	259
Stock Quotations	259
Applications of Power	259
Business Notices	260
Our Illustrated Record of Electrical Patents	260

New Advertisements.

The Okonite Co.—Insulated Wires and Cables	i
Railway Telegraph Supply Co.—Insulators	ii
Southern Electric Co.—Electrical Supplies	v
Hine & Robertson.—Damper Regulators	v
Consolidated Electric Light Co.—Electric Light Plants	vii

Vol. V. NEW YORK, JUNE 27, 1885. No. 26.

Now that there is about to be held "The Novelties" Exhibition in Philadelphia, we may remark with what ease the English-speaking people incline toward "ies." London has lately adjourned her "Healtheries," and her "Inventories" is now in progress, and her "American Exhition," soon to come, is already called "The Yankeries."

AT a time when New York and Brooklyn are seriously agitated over the projects for burying electric wires, our Western correspondent a letter, describing how the problem is being dealt with in Chicago, is very opportune and interesting. We share his opinion as to the brightening of the prospects in that city for the electric light companies.

DURING her recent stay in West Indian waters the "Dacia" picked up about 40 knots of the original Havana-Key West cable of 1869. The core was found to be in good condition, and the cable has been stored at Key West for future possible repairs, new cable being laid in its stead. The test of 16 years of service in the Caribbean is not a mild one.

IT is stated that, as the result of experiments made last summer, a part of the Russian cruising fleet has been supplied with launches provided with electric accumulators capable of propelling them for fifteen or twenty hours at a speed of five or six knots an hour. As such launches are noiseless, and can thus run from seventy-five to a hundred miles without stopping, they ought to be found very serviceable in naval operations.

WE are indebted to Mr. W. H. Preece, F. R. S., for an autograph copy of his very interesting paper, read recently before the Royal Society, on his experience in charging secondary batteries. This is a subject to which Mr. Preece has devoted considerable time and attention, and he deals with it in a thoroughly judicial and impartial manner. To say the least of the practical results of his work, they are encouraging, and as much so as those obtained by Mr. E. P. Roberts in lighting Cheyenne, Wyoming.

WE learn from Baltimore that the preliminary tests made there on the Baltimore Union Passenger Railway Company's line between Huntingdon avenue and Woodbury, have been very successful. Under the old system now to be superseded, 60 round trips are made per day, each occupying 45 minutes, and 29 horses are necessary to operate the line. This work is to be done by the Daft system with notable saving, and hence the carrying out of the contract is being eagerly and closely watched by electricians, capitalists and street-car companies everywhere.

THE school of experience is truly an expensive one, as was shown in the recent explosion on board the British iron-clad "Inflexible." The gas accumulated in the coal bunkers was suddenly exploded by the lamp of a coal-passer, and the accident resulted in the killing and wounding of several men and considerable damage to the ship. Provisions have already been made against the recurrence of the accident, by placing the electric lights even in the coal-bunkers. We see no good reason why the latter should have been left without them, especially as the atmosphere there is murky with dust and, as shown, laden with gases which are liable to explode at any moment on contact with a flame.

A CARD was issued a few days ago to the users of incandescent lights by Col. C. H. Banes, the president of the Consolidated Electric Light Company, quoting from the patent granted to his company for an incandescent lamp having a conductor of a carbonized fibrous or textile material, and intimating that it was the purpose to bring action against infringers, and to maintain the patent by the usual legal methods. This was carried out on the 22d inst., when the company filed an application in the United States Circuit Court against Mr. Edison and the Edison Company for an injunction restraining them from making, using or selling filaments for incandescent lamps of the nature described. The motion for a preliminary injunction will shortly be heard. In this manner the litigation already pending becomes further complicated and involved, and it is rather difficult to tell when and what the end will be of all the various suits.

WE stated last week that a report was current as to the intention of Mayor Grace to appoint as one of the Commissioners of Electrical Subways an expert who had declared against the practicability of underground wires. The Mayor has since then made it his business to contradict the rumor specifically. He says: "I believe it has been hinted that some one might be named by me who had in some way pronounced his hostility to placing the wires underground. That is untrue. I would regard such a man as ineligible for appointment on the commission. When the time comes I will present the names of three men against whom nothing can be urged. I regard the question as of vital importance to the people of New York, and I mean to see if a good commission cannot be formed. I think there should be some one on it who is acquainted with mechanical appliances." Names to the number of a score are mentioned in connection with the three New York appointments, and as many more for those of Brooklyn. It seems to us that the companies whose money is to be spent are justly entitled to a voice in the settlement of the matter.

THE subscription lists to the second series of the stock of the Serial Building Loan and Savings Institution, which is almost wholly a telegraphic organization, are now open and will close on Tuesday, July 21. For prudential reasons the board of management have limited the issue of stock to 500 shares, the greater portion of which has already been taken up. It is worthy of note that there has been but one withdrawal from the original list, and that was due to the holder moving to the West. All the shares are held firmly. All the money is loaned out each meeting night at favorable rates of interest. About $8,200 is now paying an average interest of eight per cent. The beneficial effects of the society are being felt by many in the matter of regular monthly savings which this plan of operation requires; and surprise is expressed by many that they could acquire the amounts credited to them in the books in so short a time. Others who formerly saw no prospect of acquiring a homestead for themselves are already laying their plans for buying or building in the suburbs, the success of others so doing giving them confidence to attempt it. The regular half yearly statement of the business of the society will soon be published, and it is looked forward to with much interest. It is with much pleasure that we see this early and abundant success.

A CURIOUS story of legislative corruption comes from Illinois. Superintendent F. H. Tubbs, of the Western Union Company's Chicago office, sent in last week to a legislative committee at Springfield an affidavit duly signed and sworn to, in which he makes some startling charges. He states that an offer was made to him by Representative J. H. Baker, of Moultrie County, to defeat the bill taxing telegraph companies on their gross earnings. According to the affidavit Baker demanded $500 for himself and $2,000 for other members whom he claimed to represent in legislative matters. This offer, the document stated, was made to Mr. Tubbs in his room at the Leland Hotel in Springfield when he was there last February. Mr. Baker being called by the committee, said, very naturally, that the whole story was untrue. Thus the statements of the two gentlemen are in direct conflict; but we think we know enough about Mr. Tubbs to give unhesitating credence to what he says. It may not be out of place to note the currency of a report in Chicago to the effect that some members of the Legislature were so hungry for spoils that they went straight to the Western Union office in Chicago, when the bill was pending, and wanted to be bought off for cash down. It is said that another affidavit is in waiting to substantiate this. Illinois must feel proud of her Legislature.

ONE of our French contemporaries has lately raised a cry against the blind faith put upon the reading of "calibrated" measuring apparatus. It bases its complaint on experiments undertaken with "calibrated" instruments of various makers, French, English and German. Six ampère meters were joined in series and current sent through them from a storage battery, when they were found to diverge widely from the true value, and far beyond the usual commercial allowance of from 1 to 2 per cent. Thus, in one of the experiments, the difference of reading between the two furnishing the greatest diversity was 39 per cent. on the lowest indication and 25 per cent. on the highest. By increasing the strength of the current the relative error diminished, but never fell below 20 per cent. Startling as these figures are, the facts developed can hardly be counted as new. Calibrated instruments, especially those of certain forms of construction, need frequent verification, and all well-constructed instruments of the class are provided with the means for that purpose. With certain instruments, which can be placed in almost any position, it becomes of great importance to use them in the position in which they are calibrated, and neglect in this respect often leads to serious errors. We believe that no conscientious electrician would use a calibrated instrument without frequent verification, so that the cry of our contemporary, "Beware of calibrated measuring apparatus," though a good warning to the uninitiated, has long been heeded by the more experienced.

OUR special report of the meeting at Cleveland of the American Association of Railway Telegraph Superintendents will be read by many with interest. The chief feature that calls for comment in the proceedings is the proposal to modify the telegraphic alphabet. This country stands almost alone in having a "Morse" code peculiar to itself. No other civilized portion of the globe, except possibly Canada and two or three other regions, tolerates the "spaced" letters, yet we now see that at this Cleveland meeting it was decided that a change was wanted and that the sign - - — — should take the place of —— for naught, or zero, in order to distinguish it from "1." Now, if the United States is to have an alphabet of its own entirely different from that used by the rest of the world, we had better be at harmony among ourselves at least, and not complicate the alphabet by varying and discordant practices. Every operator knows that for years the same sign - - — — has on the Associated Press lines been the signal for a word beginning with a capital letter—thus, "- - — — People," means People under republican forms of government, with a capital P. The Associated Press has for years used the sign "sx" for a lower-case letter, followed by an apostrophe, as in "*coup d* (sx)'*etat*," yet the Western Union men are now using the sign for "dollars" as "sx"—thus "sx 1,500." The lesson we wish to have drawn from this is, that when superintendents who are able to superintend, or any other competent thinking men, get together in convention, they might as well mercifully refrain from confusing the various systems of telegraphy by the introduction of these perplexing novelties. Or if there is to be a change, can it not be made in the direction of greater uniformity?

A New and Important Application of Electricity.

In our last issue we drew attention to a new and interesting application of electricity, which we believe is destined to rise to considerable importance in the arts. The object accomplished is the rapid settling or condensation of fumes, gained by passing an electric discharge through them. The new work is the outcome of a beautiful experiment first shown by Dr. Lodge in England, and also in Montreal, at the late meeting of the British Association. In the course of these lectures he brought before his hearers the curious observations which he had made as to the effect of a discharge of high-tension electricity from a point, or points, into glass jars or other vessels containing dust of any kind in suspension. He also made interesting and striking experiments illustrating his remarks. Thus if a bell-jar be filled with a dense smoke of magnesia, by burning some magnesium wire inside it a very long time elapses before the magnesia settles out and leaves the glass clear of smoke. But if a metallic point be introduced into the jar, connected by a wire to one of the poles of a good frictional, or induction, electric machine, it is only necessary to set the machine to work, and almost instantly an extraordinary effect is observed inside the bell-jar. The magnesia smoke commences to whirl about and then forms itself into large flakes and strings which rapidly settle on the bottom and sides, leaving the jar perfectly clear of smoke. What would have taken several hours to settle in the ordinary course, is completely cleared and deposited in a few seconds. The same effect is produced if the jar is filled with any kind of smoke, that from thick paper, or from a cigar, being acted upon exactly in the same manner as the magnesia. Professor Lodge told his audience that he and his assistant had made experiments on a very much larger scale than those in the glass jars. Rooms had been filled with dense smoke and rapidly cleared in the above manner.

These lectures, says our contemporary, *Engineering*, came under the notice of Mr. A. O. Walker, one of the proprietors of a large lead-smelting establishment, who saw in the experiments a solution of the troublesome problem of condensing the "lead fumes." For this purpose an experimental flue with glass sides was built, for the purpose of observation. The electric machine employed was on the Voss system, the glass disc being 18 inches in diameter. It was worked in a small shed erected close to the experimental flue. One pole of the machine being connected with the ground, the other was connected to an arrangement of metallic points placed inside the flue, and exactly between two of the windows above mentioned. A well-insulated copper wire led from the pole to the top of a stout brass rod, which was fixed to the top of the flue, projecting some distance above it, and reaching so far into it as was necessary to sustain the discharge points in the desired position. This brass rod was fixed inside a glass tube of considerably larger diameter, in order to insulate it where it passed through the top of the flue. During the experiments several different arrangements of discharge points were used, as for instance a brass ball having spikes projecting from it all round, a ring with spikes fixed upon it pointing in all directions, a cross studded with spikes in a similar manner, etc.

The electric machine, being kept dry and warm in the shed, worked in a very satisfactory manner during all weathers, giving sparks some four inches in length. The first experiments were tried with the fume in a state of rest; these proved eminently successful, causing the flaking and falling of the fumes in a few minutes, which in the ordinary way would have required many hours.

Further experiments were then tried as to the action of the electric discharge upon the fume in rapid motion as it is in the flues of the works. The damper in the main flue being closed, the whole of the pressure of furnace gases was turned through the experimental flue and allowed to stream out into the air. Then the electric machine was worked as before. No effect could be seen through the windows because the rapid current swept the fume onward too fast to allow of any change being observed at that point. But at the outlet into the atmosphere, a few seconds after the discharge of electricity commenced, the effect was again very striking, the issuing fume again changing from fog into flakes. A glass plate held in the current before the discharge of the machine began, was only coated, after considerable time, with a thin film. A similar plate held in the current during the working of the machine was instantly coated over with flakes and large separate specks of fume. So much was the fume agglomerated by its passage past the discharging points, that on some occasions in perfectly calm weather some of it would fall to the ground immediately on leaving the exit opening of the flue. In short, the series of experiments proved that what took place under the bell-jar took place equally in the flue of a smelting-works, with all the attendant circumstances of heat, moisture and acid vapors.

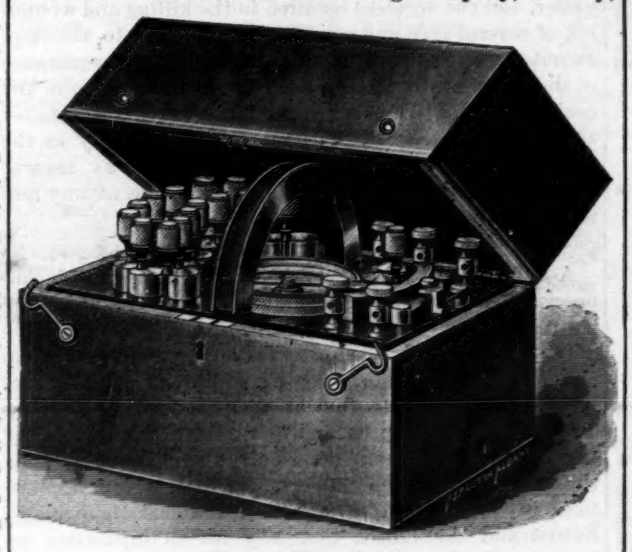
The trials of various arrangements of discharge points seemed to show that, within certain limits prescribed by the power of the machine in use, the more points employed the better was the result, the points being spread as uniformly as possible over the cross-section of the flue through which the fumes are passing. Mr. Walker is rapidly pushing the installation of the process on a large scale in his works, and proposes to extend it in England and most European countries and in the United States. It is intended to apply it to other branches of metallurgy besides lead-smelting, as, for instance, the condensation of zinc oxide in the manufacture of zinc-white, and the condensation of arsenic. But its principal field of usefulness will doubtless be in lead works, where so far all the proposed systems of condensers have either failed outright or proved so costly to erect and to work that the very imperfect results obtained did not render it worth while to continue their use. We may add that it has even been suggested to prevent the "smoke nuisance" by the application of this method. We are not aware that any experiments have been made in this direction, but judging from analogy the possibility of the scheme seems apparent. A trial in this direction might prove interesting and valuable.

Removal of the Brush-Swan Company.

For some time the Brush-Swan Company have felt the lack of facilities and room for adequately displaying their system, and in order to better accomplish this they have removed their offices from Broadway. They now occupy part of the building of the Brush Illuminating Company, of this city, having the entire second floor at their disposal. Here they will have an operative display of all their extensive apparatus, upon which work is now being rapidly pushed. Although the two companies occupy the same building, their affairs remain, as heretofore, entirely distinct; but the present step marks the beginning of a vigorous business policy to be pursued in the future. Their new location is at Nos. 204–210 Elizabeth street.

Handy Testing Set.

Electricians often have occasion to undertake tests outside of their laboratories, and for this purpose a convenient set of instruments is highly desirable. To meet this want the Electric Manufacturing Company, of Troy,



HANDY TESTING SET.

N. Y., have had devised for them by Mr. H. L. Bailey the apparatus shown in the accompanying engraving. It consists essentially of a three-coil tangent galvanometer, a rheostat and combination key, contained in a mahogany case. There are thirteen coils in the rheostat, 1,443½ ohms in the aggregate, and they are respectively; ½, 1, 2, 3, 7, 10, 20, 30, 70, 100, 200, 300 and 700 ohms.

With the three coils of the galvanometer currents of the smallest and largest power can be measured; and the set as a whole can be used for nearly all the ordinary testing work.

Electrical Nomenclature and Notation.

Before the advent of the dynamo and its use in various directions, the telegraph may be said to have been the chief application of electricity; and hence it comes that electrical nomenclature at the present time is largely made up of telegraphic terms which, from convenience, have been transferred to the other fields developed of late years. But even this brief period has seen the introduction, if not the adoption, of quite a number of new terms, whose use has been well-nigh unavoidable in the ever-widening domain of electricity, and still the end is not yet reached. It must be admitted, however, that considerable looseness, and even discrepancy, exist in regard to a large number of electrical terms which are supposed to be synonymous. Men of science, as well as practical men, long ago saw the necessity of establishing standards, and this end has already been attained or approached in the adoption of electrical units. But electrical nomenclature and notation are still sadly deficient in uniformity, and with the large and increasing intercourse of nations there thus arise serious inconveniences and frequent misunderstandings. Even in our own language this lack of uniformity in terms is very marked, and has given rise to considerable discussion regarding its remedy. The International Society of Electricians has taken up this subject, and has appointed a committee in response to the suggestion of M. Hospitalier. The English Society of Telegraph Engineers and Electricians has also devoted some thought to it, but as yet nothing definite has been decided upon. Recently Mr. Andrew Jamieson read a paper before the latter society, entitled "Electrical Definitions, Nomenclature and Notation," in which he showed in a very apt and able manner the confusion which exists in our present electrical literature. We need not quote his remarks; it is sufficient to say that there is scarcely a single term employed in electrical literature upon which different writers thoroughly agree.

What holds true in terms and definitions is true of electrical notation, though perhaps not to so great an extent. But Mr. Jamieson does not stop at describing the evil; he has also sought to remedy at least a part of it, and that is as it affects the notation. He has constructed a long list of notations and symbols, which he submits as, according to his view, supplying a uniform and convenient system.

He divides these into various groups, of which we will here notice only the one entitled "Practical Electrical Currents," as being that which would find most general application. The table is, on the whole, a good one, but there are, in our opinion, certain objections to it. It may be set down as a maxim that in a standard system of any kind the notation should be as simple as possible, and that the characters should, if possible, be selected from those in general use. We notice, however, that the quantity employed perhaps more frequently than any other, the ohm, is represented by the small Greek letter *omega* and the megohm by the capital. We see no reason why these quantities should not be represented by the Roman *o* and *O* respectively, and thus make it conform to the *A* (ampère) and *E* (electromotive force) of the same table. Similarly, the Greek symbol *phi* for the farad might be equally well expressed by the Roman *F* without conflicting with any other letter in the table. While there is no objection to using Greek letters to denote *specific* or relative quantities, their use for other purposes should be limited as much as possible. The whole subject is one of the greatest importance, and may well absorb the attention of the electrical world. It would be rash, however, to undertake a revision without due consideration. The subject is well worthy of the labors of scientific bodies, and an international congress might further the more complete establishment of standards by the appointment of a committee, similar in complexion to those which have formulated the ones already adopted.

Recovery from Alleged Severe Electric Shock.

Dr. A. L. Hummel (*Medical Bulletin*) recounts some curious cases of recovery from shocks which, according to "received ideas" upon the subject, ought to have been fatal. One is that of an employé of the Brush Company, who, while still grasping the wire in his left hand, cut it with a pair of nippers held in the right. The current was at once established through his body, and he was held to the wire at the top of a thirty-foot pole for three minutes at least, by which time a ladder had been procured and he was released by a fellow-workman. During this time a current of 3,000 volts had apparently passed through his body, yet he was able to reach the pavement with slight assistance, suffered little or no constitutional disturbance, save a slight rise in temperature, and was not confined to his bed. His punishment was limited to the charring of three fingers on the left hand and a small but deeply burnt hole in the palm of the right hand. The only treatment was that employed for simple burns.

Another case was afforded by one of the workmen of the Bell Telephone Company, who having climbed a pole belonging to the Brush Company in order to carry a wire over it, grasped the positive end of the wire with one hand, and the negative with the other. Here he was held until an assistant ran five squares to the electric light station, when the current was broken and he was released. A rope had been attached to him and passed over the end of the pole. This was held by another man, and he was thus prevented from falling. Though unconscious for awhile he soon rallied, but his pulse never exceeded 86, nor his temperature 101°. The thumb of the left hand was burned nearly off, as also the index and middle fingers of the right hand. These were all amputated.

Accepting these vague accounts as true, we fail to see in what manner our "received ideas" on the subject of the fatality of electric shocks ought to be changed. From the wording of the description it is evident that Dr. Hummel is no electrician. As a matter of fact, however, we are at a loss to know how the unfortunate man, in the first instance, was able to grasp parts of the circuit, the difference of whose potential was 3,000 volts, unless he was at the machine itself. Judging from the description, the line-man simply converted his person into a shunt between two points, the difference of potential of which could not have been very great.

The same reasoning holds true in the second case. The telephone line-man may have grasped the wires which included one or a limited number of lamps between the two points, and hence with no large difference of potential.

In both cases there is nothing to prove that 300 volts or more marked the potential of the contact points. We venture to assert that 3,000 volts would have put the man beyond the help of a physician, and our "received ideas" on the subject are consequently still unshaken.

A Model Telephone Exchange.

The new Boston telephone exchange, corner Franklin and Pearl streets, completed a short time since, has many novel features, and embodies all of the most advanced ideas in telephone construction. It was visited with the greatest interest by all the members of the Telephone Conference held lately in Boston. No open wires are allowed to enter the building, all being led in through cables either overhead or underground. A massive tower, built into the walls of the building, receives the strain of the cables, and forms a large square room, which contains the heavy current protectors and the "cross-board," having a capacity of 4,800 wires. The plan for the protection of the switch-board against electric light currents is unusually complete, and has for its basis the fusible cut-out, devised by Mr. T. N. Vail. The outside terminals of all cables are provided with both lightning arresters and heavy current protectors.

The switch-board plant consists of 10 sections multiple board, equipped for 2,000 subscribers, and having an ultimate capacity of 4,500 lines; 1 section multiple switch-board for use of toll line operators; 10 toll tables, and 12 express boards. A separate room has been provided for the extra-territorial and express business, and both show an increase of business, owing to the improved service with the new apparatus.

The main exchange is in a large, abundantly lighted and well ventilated room, illuminated at night by incandescent lights, and made very attractive at all times by the addition of shrubs and flowers, the gifts of Messrs. Vail and Parker.

As a vast amount of cable was used in connecting the boards, trouble was feared from cross talk, retardation, etc., and the result has been awaited with interest. Fortunately, the boards are practically free from cross talk, and conversation through them is certainly 25 per cent. better than by the old system.

New York Electrical Society.

At the meeting of this society, held on June 10, in their new quarters at No. 234 Broadway, an interesting paper was read, and several experiments were shown by the president, Dr. P. H. Vander Weyde. At the outset Prof. Vander Weyde remarked that the substance of his paper, entitled "The Electric Light from a Sanitary Point of View," was written several years ago, and formed the basis of a report for the improvement of the atmosphere in the Brooklyn court-house. This report was to have appeared in a journal devoted to sanitary science, but as it was strongly in favor of the adoption of the electric light as a remedy for the existing evil, the "sanitary" journal refused to print it, for the reason that the latter was published in the interest of gas-stock holders and gas-fitters. The paper read showed the conceded superiority of the electric light in a conclusive manner, and elicited the applause of the members.

The president then proceeded to demonstrate the method of transmitting electric currents through water without the aid of conducting wires or cables. Two copper strips connected to the terminals of a battery were immersed in a porcelain trough filled with water. Opposite these two strips two others were placed and put in connection with a galvanometer. On closing the battery circuit the needle was deflected, and by varying the position of the immersed electrodes the effects were changed, thus showing that Ohm's law holds true for liquids, as well as solids. Prof. Vander Weyde drew attention to the important fact that his experiment was undertaken in an *insulating* trough, and that when such was not the case, as, for instance, when the earth was used as the receptacle, the conditions were altered; and that herein lay the difficulty encountered in the practical application of this method. He showed that when the earth was employed, except under special conditions, it constituted a reservoir into which the discharge passed without giving the desired result. During his remarks he announced the interesting fact that he had tried this method as far back as the year 1839, and that he then encountered the difficulty just mentioned. This demonstration was followed by another, showing the action of induction as applied by Mr. Phelps to the transmission of telegraphic signals to moving trains, recently described in THE ELECTRICAL WORLD. This elicited some discussion by the members, after which the meeting adjourned for the evening.

A New Oscillating Engine for Electric Lighting.

Improved forms of dynamos and engines are brought out every week, and in the latter class we would draw attention to the new oscillating engine introduced by Messrs. Moore Bros., of Portsmouth, Ohio. This engine, which is designed for small powers, embodies a number of interesting features, and is specially designed with the view of obtaining simplicity, compactness and general efficiency at low cost.

Our illustrations show the engine detached, Fig. 1, and connected to a dynamo, Fig. 2, and give views of both sides.

It was the aim of the designer, Mr. E. L. Moore, to combine all the advantages of a good slide-valve engine with the acknowledged advantages of an oscillating cylinder, and at the same time turn out an engine capable of being run in either direction without the use of eccentrics, links or their connections. The principal feature of the design will thus be found in the distributing arrangement, the valve being of the ordinary D-form, and worked by the oscillations of the cylinder.

This adaptation allows of economical use of steam, and by a simple arrangement permits of the engine being reversed. This is effected by turning the small hand-wheel at the lower end of the cylinder. By means of a segmental rack-and-pinion arrangement, the centre of oscillation of the small connecting-rod is thrown from one side of the centre-line of the trunnions to the other, at the will of the attendant. This feature of the valve-motion is specially applicable to elevator work and all classes of work requiring frequent change of direction of motion.

The steam connections are all placed inside the cast-iron case which constitutes the bed of the engine. The manner of leading in live steam and removing the exhaust also presents considerable novelty. The steam, after having passed through the governor-valve, is led to the centre of the inside trunnion. Here it enters a brass tube concentric with the trunnion, and after passing through this it is carried around the cylinder and into the steam-chest. The exhaust steam passes from the valve port around the opposite side of the cylinder and out through the back trunnion through a channel formed around the live-steam pipe. By leading steam and exhaust through one trunnion in this manner, only one stuffing-box is necessary. An unusually large stuffing-box around the piston-rod, together with a well-fitting piston, gives a sufficiently long bearing to insure satisfactory behavior. The lower end of the cylinder is fitted with a relief-valve for water of condensation. This valve is furnished with a spring holding it against its seat, and is worked by a treadle, shown at the back of the engine.

All the other parts are constructed with equal care, and altogether the engine embraces a number of valuable features which will be readily recognized.

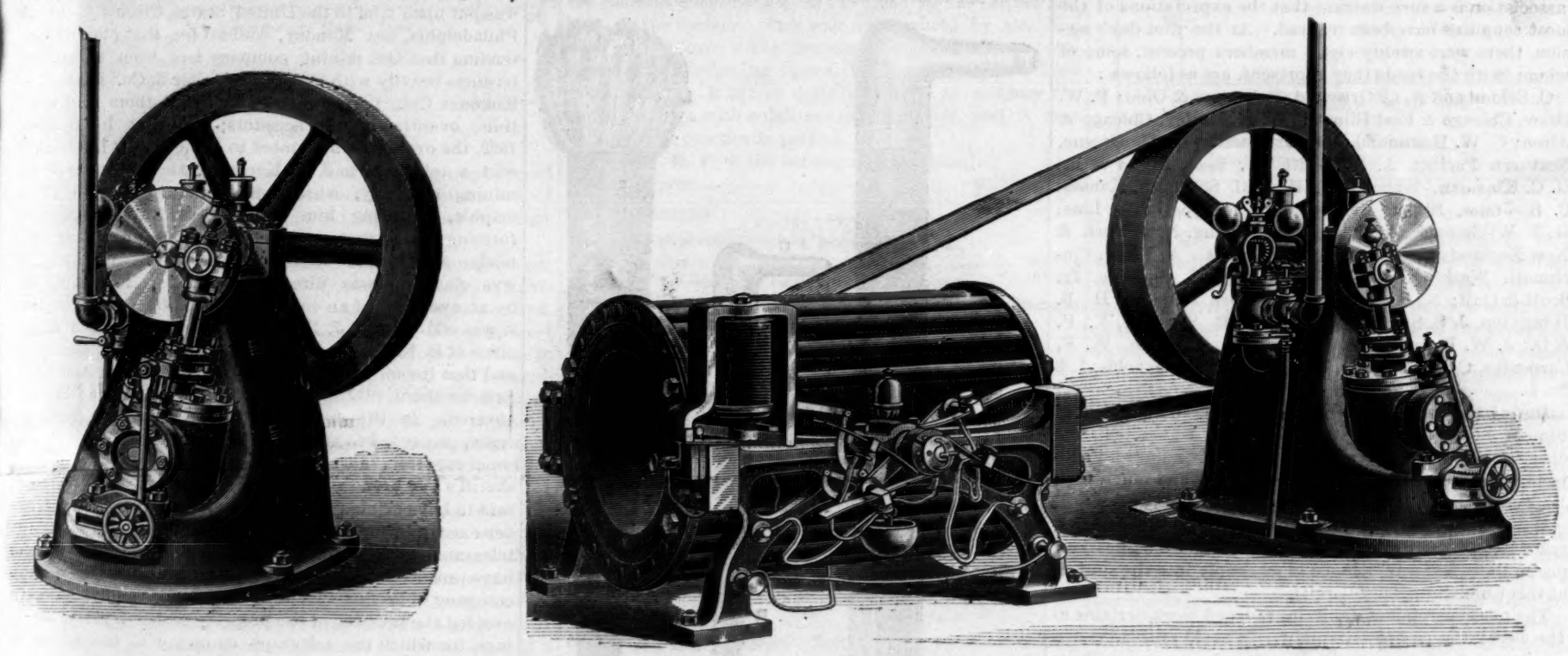


FIG. 1. OSCILLATING ENGINES FOR ELECTRIC LIGHTING. FIG. 2.

A Constant Cell.

A correspondent of *Science* gives an account of a constant cell lately experimented with by him. From the description it will be observed to be a modification of the Lalande & Chaperon cell described and illustrated by us last year. He says:

"Since October last I have made some experiments on the zinc-alkali-copper oxide cell with a view to determine the practicability of some modification of it.

"The fact that copper and iron, and perhaps some other metals, dissolve in potassium (or sodium) hydrate when used as cathodes, suggested to me the possibility that the formation of the alkaline cuprate might occur at a definite and practically convenient difference of potential between the electrodes immersed in the alkaline bath. As a matter of fact, I find that a cell mounted with amalgamated zinc, potassic hydrate and metallic copper gives, when charged until a blue color appears, a deflection of a hundred and seventy divisions on the scale of a Thompson galvanometer; the Daniell, mounted with saturated zinc sulphate and copper sulphate, giving a hundred and fifty-six divisions. The zinc-alkali-copper cell is joined by a double key to charging-cells and to the galvanometer, a resistance of over nine thousand ohms being included in the circuit of the latter.

"The proper shunt is, of course, employed. This deflection of a hundred and seventy divisions seems to be invariable, and the cell experimented upon promises to be a desirable practical standard of electromotive force. Its excellence appears to consist in the fact that the cuprate produced breaks up before it diffuses to the amalgamated zinc, depositing oxide of copper, which sinks. The zinc is suspended about an inch above the copper—which is a spiral ribbon, exposing about two square feet of surface—and the resistance is less than an ohm. I have used a ten per cent. solution of 'depurated' potassic hydrate. After some trials, it is found that the shifting of the cell from the charging source to the galvanometer circuit may be done leisurely, as the electromotive force does not seem to begin to fall off for some minutes. Further testing of the effect of changes of temperature, strength of solution, etc., is in progress. Thus far the temperature of the cell has been allowed to vary very little, not enough to affect the readings."

Tropical Telephone Finances.

At a meeting of the Tropical Telephone Company's directors, last week, it was voted to pay dividend No. 2 of 10c. per share (1 per cent. on par) July 15 to stock of July 1. The financial statement showed:

Cash in bank	$14,692.85
Cash due from sub-companies and others	17,888.00
Quick assets	$32,580.00
Less accounts payable (entire debt)	5,000.00
Available surplus (75c. per share)	$27,580.00

The other assets of the company are estimated as:

50 shares Companhia Telephonica, Brazil, at $50	$2,500
470 shares Companhia Nacional, Brazil, at $75	35,250
Exclusive contract for entire empire of Brazil, say	50,000
One-fiftieth interest in West Coast Telephone Co., say	2,000
3,000 shares, 1-5 interest, West India Telegraph & Telephone Co., and permanent supply contract with same, say	2,500
4,000 shares, 1-5 interest, Inter-Continental Telephone Co., and permanent supply contract with same, say	10,000
Remaining unlicensed territory in South America and West Indies, say	500
Contingent claims in Brazil, furniture, etc	3,000
Total	$105,750

The above assets equal $3.69 per share upon the 36,118 issued shares. The company expects to continue dividends regularly.

The Association of Railway Telegraph Superintendents.

The third annual meeting of this body was held at Cleveland, O., June 17 and 18, 1885. This is a young and growing society of men who have the care of the railway telegraph departments of the United States, and has for its object the improvement of the telegraph service and the advancement in general of the interests of this most important and fast developing branch of railway work. It is essentially a Western institution, or at least has so far seemed to be, but as its beneficent results are felt by the railway telegraph employés, as well as by the railway managers, its membership is extending, and will doubtless soon cover the Eastern lines also.

The old organization, called the American Electrical Society, which for years held its annual meetings in Chicago, came to its death, as will be remembered with regret by many, by the discovery of the telephone, and the consequent all-absorbing work connected with its development and introduction. Ever since the telephone swept so many from the ranks of the workers in the old society and made them rich, the new men and a few of the "old-timers" of the new school felt the need of a periodical meeting of the telegraph men.

In addition to the desire of telegraph managers to be cemented together in friendship, they needed the occasional conference to keep even with the constant development of electrical railway appliances. Further than this, there is presented an opportunity for interchange of ideas as to the betterment and discipline of the operators.

The interest exhibited at this third meeting of the association is a sure warrant that the expectations of the most sanguine have been realized. At the first day's session there were twenty-eight members present, some of whom, with the roads they represent, are as follows :

C. Selden and N. C. Griswold, Baltimore & Ohio; P. W. Drew, Chicago & East Illinois; W. K. Morley, Chicago & Alton; C. W. Hammond, Missouri Pacific; O. C. Greene, Northern Pacific; A. R. Swift, C., Rock Island & P.; G. C. Kinsman, Wabash; J. H. Hill, Southern Kansas; C. S. Jones, Illinois Central; H. C. Hope, Omaha Line; G. T. Williams, Nickel Plate; G. L. Layng, New York & New England; T. J. Higgins, Bee Line; C. A. Berry, Cincinnati, Washington & Baltimore; H. C. Sprague, Ft. Scott & Gulf; N. B. Patterson, Western Indiana; H. F. Houghton, J. S. Stevens, Wabash; J. B. Shaw, N. Y., P. & O.; J. W. Fortune, Grand Trunk; P. J. Weise, W. F. Carpenter, C. S. Rhoads, Bee Line; C. C. Reynolds, I. & St. L.

During the two sessions of the first day, a great deal of routine business of the association was transacted, and discussion was profitably enjoyed on many important subjects: among others, the faults of the old and much used Morse alphabet.

While there was strongly expressed a great desire that space letters might be changed, and other modifications made, there was a reluctance to go deeply into the subject at this time.

The most pernicious fault in railroad work pertains to the use of the cipher or naught. In rapid railroad transmissions, where necessarily all numerals are sent without being spelled out, it is especially important that every one should have a clear individuality.

The following resolution was unanimously adopted :

"*Resolved*, That this association is in favor of having a different symbol for the cipher from the one now used; that it be changed to - - —— —— (two dots, two dashes) instead of the long dash. That a copy of this resolution be forwarded to the presidents of the various commercial and other telegraph companies requesting them to cooperate to this end."

The Phelps Induction Telegraph Company and the Railway Telegraph and Telephone Company having been requested to have representatives present to explain their systems of telegraphic communication with moving railway trains, the former was most satisfactorily represented by Mr. L. J. Phelps, the inventor, and their manner of operation, construction and cost of lines and equipment fully related. Lieut. Tappan represented the other corporation, and gave some idea of the plans proposed and experiments already tried, but was not at liberty to make public the full details of the appliances and mode of operation. The information conveyed by these gentlemen was most gratefully received.

Preparation of new forms and modification of old ones, referring to employment and dismissal of employés, was agreed upon. These forms have for their object mutual protection against bad men and mutual assistance for promotion of good ones in the service. In this connection an account was given of the educational institutions of the Baltimore & Ohio Railroad Company, for the improvement of their men. The school at Baltimore includes a valuable collection of testing and experimental electrical instruments.

Before the close of the meetings, the members arranged a very pleasing surprise in the presentation of a very fine gold-headed cane to the retiring president, Mr. C. Selden.

The next annual meeting was arranged for at St. Paul on the third Wednesday of June, 1886.

Fourteen new members were elected, representing the Mexican Central, Virginia & Truckee, Ft. Worth & Denver, West Shore and other roads.

In the election of officers, C. W. Hammond, of the Missouri Pacific Railroad, was made president, vice Mr. C. Selden; Mr. G. L. Layng, of the New England, vice-president, and P. W. Drew, of Chicago & E. Ill., was continued secretary and treasurer. Mr. Hammond is also the president of the "Old Timers," which organization will hold its annual meeting in New York in August next.

Lightning Rods for Oil Tanks.

The great value of the property annually destroyed by lightning has called forth innumerable lightning arresters. The large oil tanks of our oil regions are especially exposed to the danger of being struck by lightning, and thousands of dollars are lost annually from this cause. To prevent this loss, Mr. C. J. Hubbell, of Washington, D. C., has devised a system of lightning rods which is based on sound principles and the action of which he recently exhibited in this city.

A model of an oil tank with ordinary lightning arrester was first shown to be liable to be struck by lightning under certain conditions. A static electrical machine was the source of electricity, and with the inventor's system of arresters no disruptive discharge reached the tank and the ignition of the inclosed gas failed to ensue, although the gas had caught fire before. Mr. Hubbell's system is based on theoretically sound principles and appears to afford a solution of an important problem.

The Electric Aurophone.

Among the latest applications of electricity in medicine is that for the improvement and cure of deafness; and in one of our issues of last year we made mention of an invention called the electric aurophone, which had been devised for this purpose by Mr. Leo Ehrlich, of St. Louis. Since then we have received a large number of inquiries regarding the nature of this instrument, and to satisfy these we give a description of the instrument, as it is furnished to us by the manufacturers, the Electric Aurophone Company, of St. Louis, Mo.

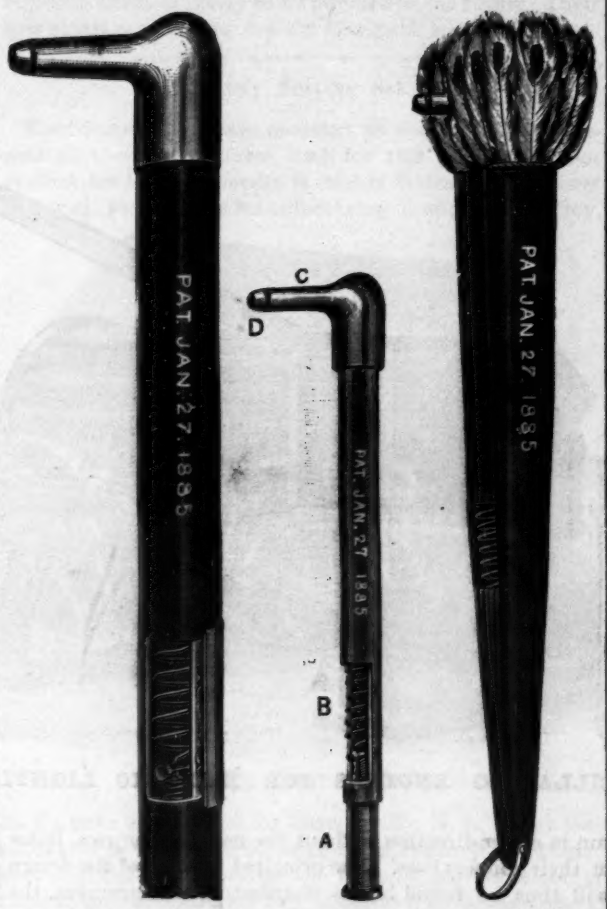


FIG. 2. FIG. 1. FIG. 3.

The accompanying illustration, Fig. 1, is the electric aurophone proper. *A* is the battery, which is practically similar to Scudder's medical, the current being produced by the oscillation of a permanent magnet within a helix. The wire, properly insulated, is wrapped around the brass helix and is continued in spiral form, *B*, to the tip of the instrument, the spiral form being adopted for acoustic reasons. *C* and *D*, separated by an insulating ring, constitute the two terminals of the wires. Hence, when the tips *C* and *D* touch the inner ear, the circuit is closed and an electric current is the result. The current is not strong enough to shock or otherwise injure the organs of the ear; at the same time, however, this mild application of electricity is said to strengthen them, and the use of the "aurophone" is claimed to be attended by the most marked beneficial results.

The illustrations, Figs. 2 and 3, show the manner of hiding the true character of the apparatus under the guise of a cane or fan. The large number of testimonials referred to by the inventor speak well for the efficacy of his electric treatment as applied to the ear.

The Electric Light on the Pennsylvania Railroad.

Our readers have already been informed that the Pennsylvania Railroad with its usual enterprise has been for some time experimenting with electric lighting for the purpose of introducing it permanently on its trains.

For the last two months one of the regular trains between New York and Chicago has been lighted by electricity and with eminently good results. The current is obtained from secondary batteries which are placed under the car-body.

At present one of the parlor cars is supplied with eighteen of the "Constant Current" storage batteries, the total weight of which is 800 pounds. They are capable of supplying 120 ampère hours. The lamps employed are of the Bernstein type, and there are 12 lights in each car. Ten of these are of 20 candle-power and two of 10 candle-power. They run at 35 volts and require 1.5 ampères for their full power.

The batteries are charged at each end of the route, and are not removed from the cars. Electric leads are run to them and connection made, similar in manner to the charging of the gas reservoirs now employed. The size of each individual cell is $6'' \times 9'' \times 11''$, so that the space occupied is very small.

Several sleepers and ordinary passenger coaches are now being fitted up, the efficiency of the battery having been proved to be very high and its construction eminently suited to the conditions under which it is used.

Suing the Telegraph Companies for Cheap Work.

The cheap operators and clerks are, at last, becoming so numerous that their un-handiwork is figuring largely in the courts of law, with more or less good effect.

The suit of the White Quail Mining and Smelting Company, of Colorado, against the Western Union Telegraph Company, brought to recover damages for losses said to have been caused by the alleged delay in the delivery of a telegram, was put upon trial in the United States Circuit Court, at Philadelphia, last Monday, counsel for the plaintiff contending that the mining company had been transacting business heavily with George R. Fisher & Co., bankers, of Kokomo, Col., borrowing money from them and sometimes overdrawing its accounts; and that in October, 1882, the overdrafts amounted to $17,000, and the bankers sent a telegram to J. H. Kershaw, the treasurer of the mining company, whose office was located in Philadelphia, apprising him of the overdraft, besides informing him that unless immediate payment was made attachment would issue. This dispatch, it was claimed, was directed to J. H. Kershaw, but by an oversight of an employé of the telegraph company it was addressed to J. H. Alexander and delivered at the office of B. K. Jamison & Co., in whose care it was sent, and that the message remained in the office of the latter firm for about two months before the mistake was discovered. In the meantime, Fisher & Co., receiving no reply, proceeded to attach the White Quail Company's personal property, said to have been worth $25,000, which at sheriff's sale brought but $11,000, and the mine, which is said to have originally cost a large sum, was sold out under execution for $5,000. It was also claimed that if the telegram had been promptly delivered, the treasurer would have procured the necessary money to relieve the mining company of its financial difficulties, and would thus have avoided the sacrifice of the property under legal proceedings, for which the telegraph company is sought to be held liable upon the ground of negligence. A verdict has been rendered for $150.25.

About the same time an Iowa young man brought suit to recover $10,000 from the telegraph company for failing to deliver a message to him in time, thereby causing him to lose a valuable situation. The message was delivered at his house, but his wife only knew that he was "out of town." After too long a delay the message reached him. He complained that the message should have been sent to his office, where his address was known, and not to his house. Justice Miller, of the United States Supreme Court, decided against him on the ground that his residence was the proper place to deliver the message, and that he was guilty of contributory negligence by not letting his wife know where he was going. The judge said that it would be a warning to men hereafter to be more confidential with their wives.

Erie Telegraph and Telephone Company.

The annual meeting of the stockholders of the Erie Telegraph and Telephone Company was held at the office of the company, No. 443 Broadway, at 10 A. M., June 8, President Bennett in the chair. There were many stockholders present, representing 31,691 shares, there being issued a total number of 48,000 shares. A stock vote for directors being taken, resulted in the election of the following: James W. Bennett, Charles J. Glidden, Charles E. Adams, Francis Jewett, A. C. Russell and A. W. Sherman, of Lowell; Wesley A. Gove, of East Boston; James A. Weston and J. W. C. Pickering, of Manchester, and W. J. McKinney, of Cleveland, Ohio. The treasurer presented his annual report. Reports were read from the various divisions, which showed the condition of the property to be good and that the business was constantly improving. The vote for directors was unanimous.

The annual meeting of the directors of the Erie Telegraph and Telephone Company was held at the office of the company at noon, President Bennett in the chair. Ballots for officers resulted in the unanimous election of the following: President, James W. Bennett; Secretary and Treasurer, Chas. J. Glidden; General Superintendent, J. P. McKinstry; Transfer Clerk, Chas. A. Grant.

Charging Secondary Batteries.*

BY W. H. PREECE, F. R. S.

1. I have for the last twelve months been experimenting with secondary batteries with a view of getting an efficient, uniform and constant source of current for electrically lighting my house, and I have succeeded beyond my expectations. Some new facts have developed themselves during my experience, which I have thought of sufficient importance to bring before the society.

2. The cells are of the Planté type, manufactured by the Elwell Parker Company of Wolverhampton. Fourteen plates of plain sheet lead 17″ × 11″ are suspended in well insulated wooden boxes filled with diluted sulphuric acid in the proportion of about 1 to 10. These plates are grouped in two groups of seven, each group being soldered to a lead strip, forming alternately the positive and negative poles of the cell. The plates of the respective poles are prevented from touching each other by ebonite grids or separators.** Each plate offers a surface of 1.8 square

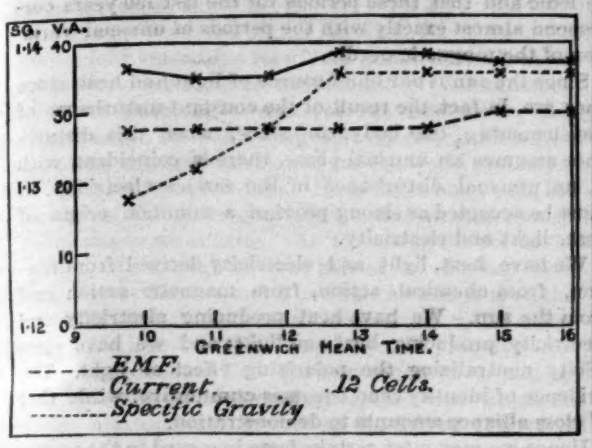


FIG. 1.

feet, so that the total surface of lead of each group opposed to each other is 9.1 square feet; that is, 9.1 square feet of peroxidized lead is opposed to 9.1 square feet of spongy lead. I use 24 such cells.

3. My charging current varies from 3 to 3½ ampères per square foot, while the current of discharge used in lighting my house varies from 1 to 1½ ampères per square foot. The total weight of each cell is 120 pounds. The plates are prepared by the Parker-Planté process before insertion in the cell, those forming the positive pole being well peroxidized, while those forming the negative pole are well coated with spongy lead.† They are thus, when put together, prepared at once to be charged. If they are not at once charged, local action sets in, and lead sulphate is injuriously formed.

4. I have cut away a small portion of the centre of the central plate of each cell to admit a hydrometer having a scale graduated from 1.050 to 1.150. The changes of the density of the liquid and of the color of the plates give the fullest and clearest indications of the behavior of the cell. The condition of the surface of the peroxidized plate as felt by the finger is also good evidence of its condition. If a plate is yellowish-brown and rough, it probably makes bad contact with the lead terminal; if black and hard, it wants the density of current regulated; if plum-colored and greasy to the touch, it is in good order, and working well.

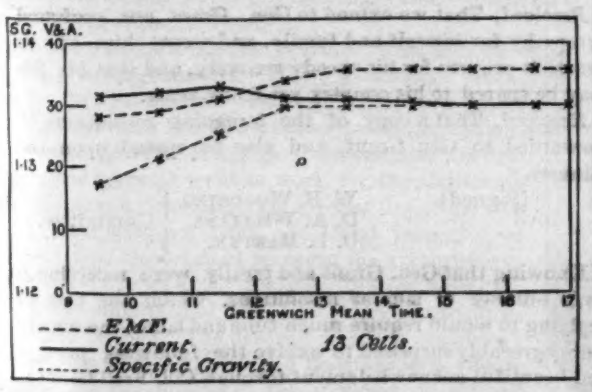


FIG. 2.

5. At the present time I am charging my battery twice a week, putting in at each charge about 120 ampère-hours. The battery is charged in two sections. During each charge observations are made every hour, and sometimes every half-hour, (1) of the strength of current flowing through; (2) of the electromotive force; and (3) of the density of one or more of the cells. The relation of these three quantities tells me the condition of the charge. The following diagrams are typical cases:

Take No. 4, which is the diagram of this morning's (April 28) charge of 15 cells. The following are the particulars:

	E.	C.	D.
9:00 A. M.	37.7	32.24	1.115
10:00 "	40.2	32.24	1.119
11:00 "	42.5	31.50	1.121
12:00 noon	42.5	30.74	1.123
1:00 P. M.	42.5	29.95	1.124
2:00 "	42.5	29.95	1.124

6. It is evident that after four hours' continuous charging the battery was full, for the density, the electromotive force and the strength of current became constant. The same scale of ordinates is used for volts and ampères. When each magnitude reaches its constant bubbles of gas are freely given forth, and energy is being wasted. The variation of the electromotive force and current strength is clearly due to the counter-electromotive force of the cells, which becomes a maximum only when the plates are fully formed. The counter-electromotive force partakes of the character of a higher resistance opposing the charging current, and increasing the proportion of the current through the shunt of the dynamo. Hence the changes of electromotive force are more marked than those of the current. Indeed, the changes in the electromotive force, as given by the voltmeter, are sufficient alone to indicate the progress and completion of the charge. They are more reliable than the evolution of gas. (My dynamo is shunt-wound, my voltmeter is Cardew's, a most reliable, simple, and valuable instrument, and my current meter a Siemens electro-dynamometer.)

7. I was at first much troubled with electrical leakage. The current escaped over the edges of the box through creeping, and the formation of moisture from the spray of the solution when bubbles of gas arose in the liquid and burst on the surface. This was quite cured by standing each box on three white porcelain supports of the form shown in the following figure, the cups being half filled with resin oil. It is now quite impossible to measure the leakage except with a delicate galvanometer, and it may be said to be practically perfect.

8. The E. M. F. of the battery at its terminals:

When charging	2.25 per cell.
When idle	2.05 "
When discharging	1.90 "

The internal resistance is, per cell:

When charging	.0060 ω
When discharging	.0017 ω

9. But the latter varies very markedly with the strength

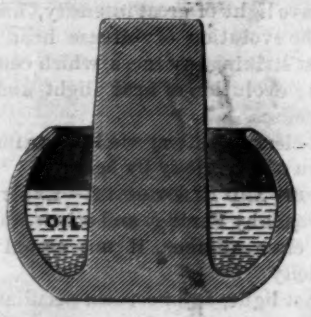


FIG. 5.

of current of discharge. This is shown by the following experiment made with 23 cells of a smaller type than those described above, which are used in the post office:

Current of discharge in ampères.	Internal resistance in ohms.
4.39	0.7608
7.25	0.4607
15.84	0.2816
25.07	0.1969

10. Thinking that this remarkable diminution of internal resistance might be due to the evolution of heat, I measured the temperature with a delicate thermometer.

Normal temperature of cell 12½° C. Current of discharge:

5 ampères	No alteration of temperature perceived.
10 "	An exceedingly slight change.
16 "	About 12¾°.
20 "	Barely 13°.

The current in each case was kept on for 20 minutes, hence the diminution is not due to heat. Since the internal resistance varies in this way, I now always take the internal resistance with the same current, viz., 10 ampères.

11. The capacity of these batteries certainly improves with age, and up to the present time I have seen no sign of decay or deterioration. M. Planté informed me that, though in course of time the peroxidized plate becomes very brittle, it is impossible to peroxidize it completely through; there always remains a metallic core to give it strength. I find that this is so. Up to the present moment I have made no careful measurements of the efficiency of my battery. I cannot do so without deranging the lighting of my house, and I regard observations on single cells as illusory. I put in about 240 and take out about 200 ampère-hours weekly, and I do not observe any change or fall in the electromotive force. When the electromotive force of these cells falls, it falls rapidly—indeed, almost suddenly. Occasionally one plate of a group becomes inactive from undue local action, or from bad connection (shown by the color). I remove this cell and put it in what I call a "hospital" cell, where it is brought into order either by a greater density of current or by reversal.

12. Reversing has a great beneficial action on a cell; it not only improves its capacity, but it removes any cause of irregular working. It is advisable to do this periodically. I have two extra cells, which enables me to have two cells always under reversal by means of the charging current. It takes from 1,000 to 1,200 ampère-hours to reverse a cell, so that at this time of year it takes a month or more to complete the operation, and it will take a year to reverse the whole battery. I have thus, up to the present time, reversed 16 cells.

* Read before the Royal Society, London.

** These ebonite grids were introduced by Mr. Charles Mosely, and have effectually removed one incessant source of trouble in these cells—viz., short-circuiting through the buckling of the plates.

† The Parker-Planté process consists of immersing for a few hours the lead plates in a solution of nitric and sulphuric acids in these proportions:

Nitric acid	1
Sulphuric acid	2
Water	17

before fixing the cells. This not only chemically cleans the lead surfaces, but it favors the formation of sulphate of lead in such a way as to be readily converted into lead peroxide and spongy lead on the passage of a strong current through the cells. The formation of the cells is thus greatly expedited.

Lady Aylmer.

No one is better known to the telegraphers of this country than Mr. James D. Reid, and no one is more heartily liked, no one more highly esteemed. The feeling towards him is of such a nature that we shall gratify hosts of his friends by relating some romantic incidents in the life of one of his daughters, who has now become the Lady Aylmer. The circumstances have recently come to our knowledge, and, although he is the last to desire publicity for them, Mr. Reid informs us, in response to our inquiry, that the story given below is strictly correct.

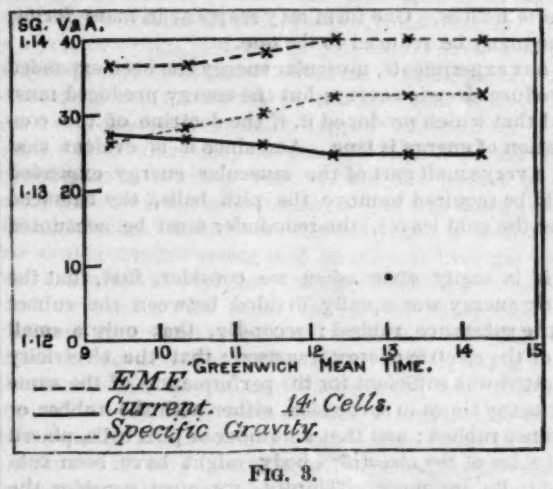


FIG. 3.

One of Mr. Reid's two daughters, Miss Anna B. Reid, who was educated in France as well as in America, developed early a taste for music, and had a voice of unusual expressiveness and power. In 1880 she went to Milan to study under Giovanni, who promised her great success. In 1881 she fell in the streets of Mentone from sunstroke, and had to be carried to Paris for treatment, and for years she struggled for her life.

Last September she had so far recovered as to be able to return to America. Mrs. Reid had crossed the Atlantic to accompany her daughter homeward. In paying a farewell visit in London, the daughter met a friend whom she had known for some time—a refined and courteous gentleman of her own age and of good family—named Arthur Percy Aylmer, who proposed marriage. He had remote expectations, had a modest home with his mother, who was an authoress and had noble connections in England, but he had no business and only a small income. However, the regard which was professed by the suitor was returned, and the marriage soon took place, the mother (Mrs. Reid) returning to New York alone.

Then began a struggle to find business. Half a year passed with no result. On the 15th of March, only three months ago, a strange thing happened. Sir Justin Aylmer, aged 24, was finishing his studies at Cambridge, England. On the 12th he had fallen from a bicycle, and on the 15th he died. The death of Sir Justin Aylmer carried a baronetcy and large estates, including an old baronial estate, to the heritage of an old man of 85, the grandfather of Mr. Aylmer, the son-in-law of Mr. Reid. Mr. Aylmer's father was dead, and young Aylmer was sent for to manage the estate. Here was employment, coupled with a generous income. Only a month later, however, the old baron died, and young Aylmer became a baronet, with a large entailed estate, with a rental of over $50,000 a year. Thus, by a strange chapter of accidents, Mr. Reid has become the father-in-law of an English baronet.

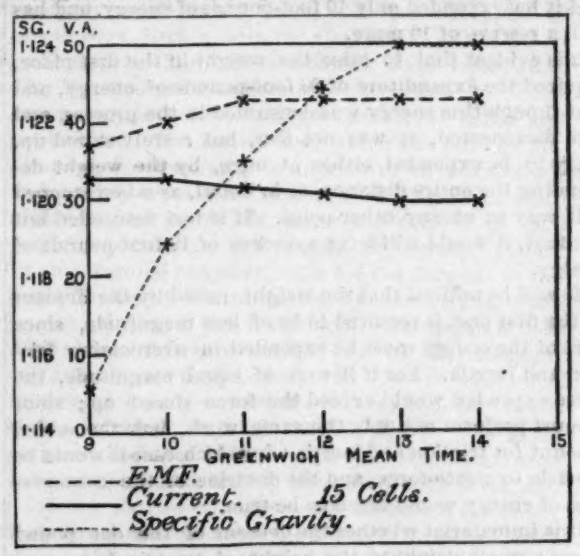


FIG. 4.

Static Electricity.

BY PHILIP ATKINSON, A. M., PH. D.

CHAPTER III.

THE NATURE OF ELECTRICITY.

THE CONSERVATION OF ENERGY.—A clear understanding of that great doctrine of modern science, known as *the conservation of energy*, lies at the foundation of a correct knowledge of electricity and electric phenomena. Hence a brief examination of its principles will not be out of place here.

Energy is a universal property of matter. It is the principle of life and movement in matter in distinction from matter itself, inseparably connected with matter and yet distinct from it; heat as distinct from the heated body; electricity as distinct from the electrified body; life as distinct from the living body.

Like matter, it manifests itself in various forms, as gravity, cohesion, chemical affinity, light, heat, electricity.

Like matter, its quantity in the universe is fixed and definite, and cannot be increased or diminished. And hence, like matter, it is indestructible. It may be transmuted from one form into another, but in the transmutation there is no loss. One form may reappear in many forms, or the many be reduced to the one.

In our experiments, muscular energy has been expended to produce electric energy; but the energy produced must equal that which produced it, if the doctrine of the conservation of energy is true. And since it is evident that only a very small part of the muscular energy expended would be required to move the pith balls, the balanced rod or the gold leaves, the remainder must be accounted for.

This is easily done when we consider, first, that the electric energy was equally divided between the rubber and the substance rubbed; secondly, that only a small part of the electric energy was used; that the electricity generated was sufficient for the performance of the same work many times in succession, either with the rubber or substance rubbed; and that a number of pith balls, placed on all sides of the electrified body, might have been subjected to its influence. Thirdly, we must consider the amount of electricity lost from contact with the surrounding air; and lastly, that the amount of heat energy generated by the friction was probably equal to the electric energy.

If the expended energy had been produced by a descending weight, which should cause a glass or ebonite cylinder to revolve in contact with a rubber, and the sum total of the heat and electricity had been recovered, in the form of work which could be estimated, it would be found so nearly equal to the number of foot-pounds expended by the descending weight, that whatever difference existed could easily be accounted for by the friction of the machinery and other causes.

Experiments of this kind have been actually performed, and the results verify the above conclusion. Similar experiments have also been made with other forms of energy, and like results obtained; so that the principles of the conservation of energy are now well established and universally recognized in all practical work.

Another illustration may render the subject more clear. A pound weight raised to a height of 20 feet has acquired 20 foot-pounds of energy; and, in descending to its former level, can accomplish 20 foot-pounds of work; as in raising to the same height another weight of nearly equal mass. But if stopped in its descent at a level of 10 feet it has expended only 10 foot-pounds of energy, and has still a reserve of 10 more.

It is evident that, to raise the weight in the first place, required the expenditure of 20 foot-pounds of energy, and that though this energy was consumed in the process, and had disappeared, it was not lost, but merely stored up, ready to be expended, either at once, by the weight descending the entire distance, or in detail, as when stopped half way or at any other point. If it had descended but one foot, it would still have a reserve of 19 foot-pounds of energy.

It will be noticed that the weight, raised by the descent of the first one, is required to be of less magnitude, since part of the energy must be expended in overcoming friction and inertia. For if it were of equal magnitude, the force expended would exceed the force stored up; since it must perform not only the same work, but the added amount for friction and inertia; in which case it would be possible to create force, and the doctrine of the conservation of energy would cease to be true.

It is immaterial whether the descent of the one pound raises a small weight to the height of twenty feet, or a large weight to the height of one foot; which it can be made to do by a system of ropes and pulleys. The twenty foot-pounds of energy expended must exactly equal the twenty foot-pounds stored up; and the height through which the large weight is raised will be to that through which the small weight descends in the inverse ratio of the mass of each.

In all electric work, of whatever nature, the same principle will be found to hold true; gravity potential in this case representing electric potential in electric work. Mechanical work may reappear as electric work, or electric as mechanical work; the energy produced being always, in some form, equal to the energy expended.

HEAT, LIGHT AND ELECTRICITY COMPARED.—The weight of evidence goes to show that electricity, like heat and light, belongs to that kind of energy known as molecular; and whatever is known as to one kind of energy may, by analogy, be inferred as to other kinds of the same class, with such modifications as distinguish different species of the same genus.

There is ample proof that heat is a mode of molecular motion. Not that the heat *produces* the motion, or the motion the heat, but that it *is* motion: that the molecules of matter being thrown into a certain kind of motion, the result is the sensation known as heat.

According to the universally accepted theory of light, it is another species of motion of the same kind; and there is proof that light and electricity are identical. But, if not identical, we may at least assume that they are closely allied to each other.

We find also that the same causes, acting at the same time, on the same bodies, and under the same circumstances, produce both heat and electricity in numerous instance; in others, equally numerous, both heat and light, and in others heat, light and electricity.

The simultaneous production of heat and electricity is seen in the examples already given of bodies electrified by friction, of which heat is also a necessary result.

Another prominent instance is the action of the electric generators known as dynamos, in which the evolution of heat is such that special provision for cooling has to be made to prevent injury. Here mechanical action is the agent.

In the galvanic battery we have a well-known instance of the production of heat and electricity by chemical action; as a certain amount of heat, more or less perceptible, is always a result.

Instances of the simultaneous production of heat and light are numerous and well known, as the heating of an iron rod, which becomes luminous when the temperature rises to a certain degree, whether it be heated by friction, as of a shaft and journal, or by the chemical action of a furnace.

The dynamo and galvanic battery have been referred to as producing both heat and electricity. When a current of this electricity of sufficient intensity is passed through a conductor of high resistance, as a fine platinum wire, or a carbon filament, they become luminous by incandescence; and when passed through two sticks of carbon slightly separated, we have light of great intensity, and there is in both instances the evolution of intense heat. These are perhaps the most striking instances which can be given of the simultaneous evolution of heat, light and electricity from the same causes.

In the thermo-electric battery we have an instance of the direct production of electricity by heat.

POLARIZED LIGHT AND ELECTRICITY.—Experiments with polarized light, made by Faraday and others, furnish strong evidence of the close alliance, if not actual identity of light and electricity.

It is known that light, from certain peculiarities of reflection and transmission, undergoes a change, so that, when subsequently transmitted, its action is different from that of the original transmission, and this change has been termed *polarization*.

Let a plate of tourmaline be so placed that a ray of light falling on it shall be transmitted at right angles to a particular direction within the crystal, known as its optical axis. Then let another tourmaline plate be so placed with reference to this one that their optical axes are parallel, and that the ray shall pass through both and form a bright spot on a screen beyond.

Now let either plate be turned, so that their optical axes are no longer parallel to each other, but still at right angles to the ray; the bright spot on the screen will fade as the angle increases, till at 90° it will disappear. Continuing the rotation, it will reappear, increasing in brightness, till, at 180°, it is entirely restored; then fading again till extinguished at the end of the third quadrant, and again increasing in brightness till restored again at the end of the fourth quadrant, or original position.

This alternation of brightness and extinction depends on the relative angular position of the plates. Let either of them be turned in either direction, and the same result follows; but when both are turned in the same direction, there is no change in the brightness, and no extinction of the light. Substitute one for the other, and the same results are obtained.

It is evident, then, that the light in passing through the first plate has undergone a change which affects its transmission through the second, in any position except when the optical axes of both are parallel, extinguishing it entirely when they are at right angles to each other.

It is also found that this effect, termed polarization, occurs to light transmitted through or *reflected from* any transparent medium, as glass, selenite, Iceland spar, and various liquids. Polished metals also produce the same effect on reflected light. And this reflection or transmission takes place at a certain angle, known as the polarizing angle, which varies in each substance by a certain definite amount.

Now let the ray be transmitted through, or reflected from a small piece of glass of suitable size or shape, placed at the proper polarizing angle, and let the plates be turned till their optical axes are at right angles, so as to produce extinction; then let the glass be subjected to a powerful electric strain and the extinguished light will reappear, continue during the electric action and disappear when it ceases; which shows that this electric action has counteracted the effects of polarization.

Similar experiments with various substances, too numerous to detail here, show similar results.

Without anticipating another branch of our subject, it may be stated here, that electricity and magnetism are so closely allied that whatever affects one must have some important relation to the other.

Recent experiments have demonstrated that unusual disturbances in the variation of the magnetic needle are coincident with unusual disturbances in the sun in connection with the phenomena known as sun spots, and that the telegraph and telephone are, at such times, seriously disturbed by what are known, technically, as "electric storms;" that is, unusual disturbances in the earth's electricity producing the phenomena known as *earth currents*.

It has also been found that these solar disturbances are periodic and that these periods for the last 150 years correspond almost exactly with the periods of unusual variation of the magnetic needle.

Since the sun is our chief source of light and heat, since they are, in fact, the result of the constant disturbance of the elements of that body, and since, when this disturbance assumes an unusual phase, there is, coincident with it, an unusual disturbance in the earth's electricity, it must be accepted as strong proof of a common origin of heat, light and electricity.

We have heat, light and electricity derived from friction, from chemical action, from magnetic action and from the sun. We have heat producing electricity and electricity producing heat and light; and we have electricity neutralizing the polarizing effect of light. The evidence of identity then becomes cumulative, while that of close alliance amounts to demonstration.

Hence we may infer certain facts in regard to the nature of electricity from what we know of similar facts in regard to the nature of light and heat. And we are also warranted in the conclusion that a well-supported theory of light or heat requires but little modification to adapt it to electricity.

This much we certainly know, that they all are forms of energy and that they radiate from the centres where they are generated. Hence the term *radiant energy* is equally applicable to each.

(TO BE CONTINUED.)

Gen. Grant and the Military Telegraphers.

At the last meeting of the United States Military Telegraph Society, held in Kansas City on May 12, besides other matters of business, the following resolutions, as prepared by the committee, were adopted:

Whereas, We have watched with painful interest the progress of the dangerous disease which has lately afflicted our late commander, Gen. U. S. Grant; and,

Whereas, In view of our association with him in the great work accomplished between 1861 and 1865, we claim more than an ordinary interest in his personal welfare; therefore, be it

Resolved, That we, as a part of the surviving members of the old United States Military Telegraph corps, wish to convey to Gen. Grant some token of our regard for him, not only as a soldier, but also as a citizen and a friend.

Resolved, That we extend to Gen. Grant our profound sympathy for himself and family, and assure him of our heartfelt prayers for his speedy recovery, and that his life may be spared to his country yet many years.

Resolved, That a copy of the foregoing resolutions be forwarded to Gen Grant, and also be spread upon the minutes.

[Signed] W. H. WOODRING, D. A. WILLIAMS, D. L. MARTYN, } Committee.

Knowing that Gen. Grant and family were receiving a large number of similar resolutions, which the task of replying to would require much time and labor, the society were agreeably surprised to receive the following prompt and beautiful acknowledgment through Col. Fred Grant:

NEW YORK, May 23, 1885.

GENTLEMEN: Gen. Grant directs me to acknowledge the resolutions passed by the Kansas City branch of the United States Military Telegraph corps, May 12, and to assure you of his and his family's appreciation of the action taken by you.

Respectfully,

F. D. GRANT.

To William H. Woodring, D. A. Williams, D. L. Martyn, Committee.

Systems of Communication.

To get the latest data as to the most convenient forms of communication in house or workshop, it is interesting to glance through the catalogue of such a house as that of W. R. Ostrander & Co., of Brooklyn. Four systems of communication are shown—speaking tubes, mechanical bells, electric bells, and pneumatic bells—so that one may readily find some system which will be adapted to his wants. The ingenuity shown in the construction of the fixtures manufactured by the above firm is noteworthy, and seems to cover all probable requirements.

GOD'S ELECTRIC LIGHT.

They were bidding the world and stars "Good-night,"
Their wee noses pressed flat on the window pane,
When Ursula gravely turned and said:
"God has forgotten something again!"

"God cannot forget, mamma always says,"
Replied Dorothy, wise for her five short years;
"He always remembers everything,
Even our little smiles and tears."

"Well, he *has* forgotten; you can *see* he has,"
Said Ursula, still looking out in the night,
"There's nothing up there but a lot of stars;
He's forgotten to fix His 'lectric light!"

"Perhaps He's shutted the door of His house,"
Replied little Dorothy, looking sad,
"We didn't do anything naughty to-day,
And so I'm sure God isn't mad.
We can't have his light every night, you see;
There are other little girls besides you and me!"

—*The Pansy.*

An Operator's Speculation in Hair.

Three or four years ago a New York youth, scarcely above his majority, went down to the Isthmus of Tehuantepec, just north of Yucatan, to work for the Interocean Railroad Company. He was a telegraph operator, and a good salary, along with an ambition to see the world and enjoy odd adventures, tempted him. He is home now. He has had enough of Tehuantepec salaries, and more than enough of Tehuantepec adventures. As for seeing the world, he has seen quite enough of that part of it. He has been drifting all over Mexico, and if one-half he tells is true, the lamented Mr. Munchausen strove all in vain to be entertaining. His hair-breadth escapes would probably not interest money-making New York as much as a passing reference to a little commercial enterprise with which he has ended his southern career. In the part of the world where he has been disporting, two of the native characteristics are a Yankee love for cash and a feminine population with incomparable suits of hair. Long and heavy and silky tresses cover every woman's head. The ladies seem to be proud of their hair to a certain extent, but money stifles pride, and a good many of the natives are wearing their locks in the intellectual fashion now, thanks to this New York boy's enterprise. He has been buying up the raven tresses by the basketful for shipment to this city. On an average a full suit cost him 50 cents in spot cash; sometimes he was spendthrift enough to squander a whole dollar on an exceptionally fine article. Here an open market has given him profits handsome enough to equip a very snug bank account. I do not recall precisely the sum he has averaged for each suit sold, but it was a very respectable pile of dollars, and sales have been ready. "*There* is a big fortune in this business for somebody," he said, "but as for myself I've had enough. After a man has put in three solid years eating black Mexican beans and drinking vile Mexican logwood in Mexican backwoods, dollars look a little less fascinating than they do up here in a land of civilization. Somebody else is welcome to future profits."

A Telegrapher's Conscience Money.

The Washington correspondent of the Boston *Herald* telegraphs to his paper that on Saturday last he was shown in the Treasury Department a letter sent in with a large sum of money for the conscience fund, which told the following remarkable story:

The writer was a telegraph operator, who, in 1866, was a passenger in the steamship "Henry Chauncey," from New York for San Francisco. During the voyage a friendship sprang up between him and a fellow-passenger calling himself Charles Edmund Hastings. On reaching his destination the operator went to work for the California State Telegraph Company. On his first day of service he received a telegram from the Chief Inspector of the Post-Office Department warning the authorities in San Francisco to look out for one Charles Emmons, who, while employed at the New York Post-Office, had stolen $5,000. The description given convinced the operator that Emmons and Hastings were identical, and, on the impulse of the moment, he slipped the telegram in his pocket, and afterward gave it to Hastings, who confessed and promised to reform if his secret was kept. A few months later he died in Nevada City. The letter ends as follows: "A few years ago, by the death of a relative, I came into possession of what, to a man of my modest desires, is an ample fortune. I desire, therefore, to make restitution to the government of Mr. Emmons' peculations, in which I considered myself an indirect accomplice. The sum inclosed is the amount of principal and interest to date."

Physician's Cabinet Battery.

With the rapid advance in the science of electro-therapeutics, a handy form of battery has become a great desideratum where applications of varying character are necessary. Thus the faradic and galvanic current have their special applications, and a single apparatus which will furnish both conveniently is evidently advantageous in an extended practice.

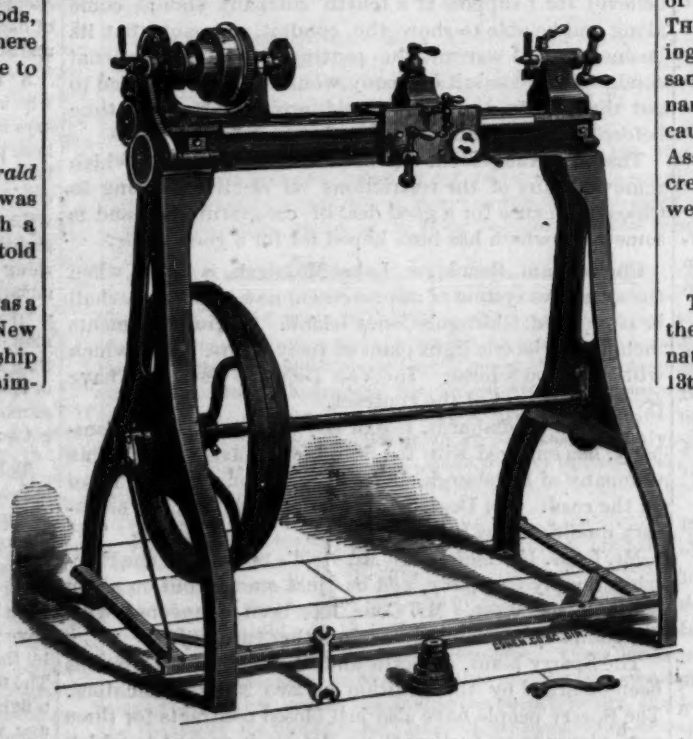
Such an apparatus is shown in the accompanying cut which represents a light and compact form of cabinet battery that has been manufactured from drawings and suggestions furnished by Prof. Ambrose L. Ranney. It is on casters, and can be wheeled about the consultation room. This admits of the use of the instrument when the patient is in the gynecological chair or upon the office lounge; or when any form of fixed apparatus, such as the laryngoscope, the inhaler or spray is used, it being simultaneously employed.

The inclosed box contains 32 cells of Bunsen battery in compact form, and any number of these can be thrown in circuit by turning the switches *R S* shown on the top of the table. By this method a steady galvanic current can be obtained of any requisite strength.

When a faradic current is desired, however, the battery

HANDY CABINET BATTERY.

circuit is broken by turning the switch *L*. The two strips *U* are then clamped in position and the vibrator *M N* put in operation, there being an induction-coil *E* and separate cell provided for this purpose. As it is often desirable to change the direction of the current, a pole-changer is provided, which is shown mounted in the centre of the table. By means of the two handles *T T*, the tray containing the cells is lifted so as to bring the latter into contact with the suspended electrodes, and when not in use they are lowered so as to prevent waste. This apparatus, which is made by Messrs. Waite & Bartlett, of this city, is handsomely finished in mahogany, and all metal parts are nickel-plated.



LATHE FOR THE ELECTRICAL WORKSHOP.

A Lathe for the Electrical Workshop.

Many inventors and amateurs suffer considerable loss of time and money by being obliged to have their ideas carried out practically by outsiders. Besides this, the danger of having their inventions appropriated by others is always imminent. To be able to construct one's own apparatus is, therefore, both a saving of expense and a pledge of secrecy, and hence, for such persons a good lathe is almost indispensable, as there are but few operations which cannot be performed on it.

To meet these special wants the lathe shown in the accompanying engraving has lately been designed by Messrs. Sebastian, May & Co., of Cincinnati, O. The machine shown is a screw-cutting foot lathe, having a swing of 8 inches above shears and 20 inches between centres.

The head stock has a three-speed cone, for 1-inch belt, and the back gear is thrown in and out by a cam. In addition, the head is detachable so as to admit of readjustment should the spindle become untrue. The tail stock sets over for turning tapers, and is fastened down by a cam. Another excellent feature of the machine is that by moving the head stock and driving wheel to the foot of the lathe, large surfaces may be turned or polished, which is especially valuable for patternmakers and others.

The driving wheel, which weighs 60 pounds, is mounted upon a shaft which runs on friction wheels, and the treadle is made of wrought angle iron. The lathe, which is substantially built, is supplied with a full set of gears for cutting threads and weighs complete 240 pounds.

Another Story About Gen. Stager.

The telegraphers are keeping the memory of Anson Stager green, and a listener can pick up a good many characteristic stories of the brusque old manager. One day a year or so ago, Gen. Stager got into a Fourth avenue horse-car to ride up town. He had his evening paper, and was deep in the intricacies of the abundant miscellany when a cold-hearted conductor tapped his shoulder and asked for fare. Carelessly he reached into a pocket for the needed coin; it was a vain search; one pocket after another gave back the same message. He was down town without a penny. Some weak-minded young women with some weaker-minded young men on the seat over the way affected merriment over the passenger's evident confusion. Then a mere lad at the other end of the car pressed a nickel into the conductor's hand. "What's your name, and where do you live?" demanded Stager, as, a few blocks further on, he prepared to leave the car. The boy answered. When he went to school the next day he wore a gold watch. A self-contained young man came to Gen. Stager to ask his help toward securing a responsible place in a down-town banking house. "Have you got a sweetheart?" was the bluff and pointed question that the caller met. "No, sir!" was his somewhat proud reply. "Then go and get one. I'm afraid of young men who are mashed on themselves. Go and find an honest girl; that's a better guarantee of honesty than all the bonds your friends can give." The coveted place, it is stated, went to another man.

"The Electrical World" Pedestal Fund.

Our daily contemporary, the New York *World*, makes the subjoined acknowledgment:

Among Saturday's contributions was the sum of $84.90, the result of a popular subscription started by THE ELECTRICAL WORLD as an auxiliary to our fund. The names of the individual contributors have been published in THE ELECTRICAL WORLD, but we take pleasure this morning in printing a synopsis of the contribution, and at the same time we return hearty thanks to our luminous namesake for the good work it has done in the Liberty cause. A contribution of $55.25 from the employés of the Associated Press, acknowledged May 31, must also be credited to the efforts of THE ELECTRICAL WORLD, and we understand that more is coming.

A Big Electric Organ.

The largest organ in the world, with the exception of the one in Riga, Russia, is in the Cathedral of the Incarnation at Garden City. Its capabilities were tested June 13th by Mr. George W. Morgan, who gave an interesting recital before a large number of ladies and gentlemen. The instrument, which was built by Mr. Hilborne L. Roosevelt, is distributed in four distinct and widely-separated localities of the cathedral, although the whole is under the control of one performer, through the agency of electric action. In an octagonal chamber, built for the purpose in the angle formed by the transept and chancel walls, is the largest portion of the instrument. The organ is here divided into floors, or stories, and in the basement are the engine, countershaft, etc. Above this, on a floor of brick and iron, are the bellows and the wind-chest, on which rest the 32-foot pipes. The great organ wind-chest, with that for the reeds and mixtures of the pedal organ, are on thenext level, and then follows the swell organ, and, above all, the choir. Each of the three manual wind-chests is furnished with its own auxiliary reservoir, or "regulator," where the wind is reduced to the pressure needed for that department.

In the tower at the western end of the cathedral is the most important division of the organ. In this room, which is 15 feet square, and is high enough to admit of one wind-chest being supported above another, are placed parts of the great, swell, and pedal organs and the whole of the solo organ, the second of these being above the first, the third at one side, and the fourth at the back. In the chapel beneath the cathedral is the third section, which is provided with claviers of its own, so that it may be made independently available for chapel purposes. This comprises a part of the choir organ, divided here between two manuals and two of the pedal stops. Its tone rises

into the church through the different staircases, and the distance lends enchantment to the sound. The last part consists of the echo organ and one pedal stop, which is placed between the ceiling and the roof, above the intersection of the nave and transept. The mysterious source of the tone produces an interesting effect. The vox humana sounds are especially realistic.

Steam power is used in inflating the bellows. One engine is placed beneath the chancel division to supply it with compressed air, and another beneath the tower to operate the bellows of the chapel division, the tower division and the magneto machine, which generates the electricity. All the wires used in making the electric connections of the instrument stretched out in a continuous circuit would extend over a distance of 21 miles. This summary will give an idea of the resources of the instrument:

	Stops.	Pipes.		Stops.	Pipes.
Great organ	31	2,406	Solo organ	7	427
Swell organ	27	1,942	Echo organ	7	382
Choir organ	23	1,444	Pedal organ	20	651
Total				115	7,252

There are 9 couplers, 11 mechanical accessories, 11 adjustable combination pedals, 9 ventil pedals, and 3 miscellaneous pedals.

The recital given by Mr. Morgan brought out many of the fine qualities of this noble instrument, and the organist himself afterward praised it warmly.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, June 25, 1885.

The American Spiral Telephone Wire Company, having their offices until recently at No. 43 Milk street, this city, have moved to Portland, Me.

Messrs. Temple & Venner, dealers in electrical goods, and who are prepared to do electrical work of all kinds, have an office at 68 Devonshire street.

The Electric Watchman's Time Register, made by the Redding Electrical Co., 30 Hanover street, is one of the most ingenious electrical instruments in the market. It is designed to give a perfect printed record of the manner in which the watchman makes his rounds and performs his duty. It is placed in the office, and connected by wire to buttons located in different parts of the building at points which it is desirable to have him visit. The buttons are all numbered, and as the watchman passes them on his rounds of duty, he presses each one, printing on the clock dial the number of the button pressed and the exact time at which he passed it.

On the 20th inst., Judge Bond, of this city, appointed Edward Harland, of Norwich, Conn., as receiver of the American Rapid Telegraph Company, of Baltimore, Md., at the solicitation of the Boston Safe Deposit and Trust Company, which holds a mortgage of $3,000,000 on the property of the American Rapid Company. The receiver is authorized to conduct the business of the company, and is required to give $5,000 bonds.

Users of dynamos or engines of any kind will be interested to learn that Messrs. Geo. Dunbar & Co., 134 Congress street, are manufacturing machinery wiping towels which are more economical than waste, can be washed easily and quickly and used again, and are in no danger from fire.

The Bernstein Electric Light Manufacturing Company, Mr. H. B. Cram, treasurer, which had offices recently in the Equitable Building, now occupy pleasant quarters in the Angello Building, No 48 Congress street.

Messrs. Thomas & Dalands, 72 Water street, tell me they can furnish particulars concerning a large mica mine in Canada, situated about 70 miles distant from Montreal, and within 15 miles of the Canadian Pacific Railroad. The entire property covers 300 acres; the mine itself about 3½ acres. The mica from this mine is pronounced to be of superior quality.

The Domestic Electrical Manufacturing Company, of this city, are having a very large sale of their new portable electric gas igniter—"dynamo form." It consists of an electrostatic inductive generating apparatus, with armatures or inductors so arranged that electrical charges are generated and conveyed to the terminals, where sparks or disruptive discharges take place and ignite the gas. The construction and operation are entirely of a mechanical nature. The whole is arranged in an elegant, portable and durable form, has no battery or coil, is not exhausted by use, and is not liable to get out of order.

The Cary Telephone Signal Co. now have offices in the Rogers Building, on Washington street, under the management of Mr. John P. Gale. The former manager, Mr. G. H. Cary, has severed his connection with the company and is no longer a resident of this city.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, June 23, 1885.

The great Exposition building has been turned into an immense popular opera-house for the summer, and is fitted up in almost enchanting style, with no end of shrubbery, fountains, etc., the whole being illuminated by fifty Western Electric arc lights, and forming a very brilliant scene indeed.

The arrangement between the local conduit company and the electric light companies which was foreshadowed in the editorial columns of THE ELECTRICAL WORLD of the 13th, has been completed, and the conduit company is pushing vigorously the work of putting down its conduits on all the desirable streets. When the work now in progress is finished, every block on the South Side (the main business portion of Chicago) will be in connection with the underground system, and at the present writing this is the case north of Van Buren street and east of Fifth avenue. A line down Franklin street will finish the South Side.

On the North Side a line is to be run along North Clark street to the limits, and on the West Side a line will be run a mile or so out West Madison street.

When the work in contemplation by the Chicago Sectional Electric Underground Conduit Company (do you get that?) is completed, it will be safe, I think, to say that no city in the country will offer the convenience for getting underground that Chicago will. All the principal blocks will be connected with the system, and the present state of things entirely reversed.

This is as it should be, for Chicago has heretofore had the reputation of being exceptionally hostile to the electric companies. You were forbidden to string wires overhead, and it was impossible to get a permit to go underground. This condition of affairs led to all kinds of tricks and subterfuges on the part of the companies, and acted as a great check to the progress of electric lighting here. I have known of several instances where important contracts were secured by the electric light companies, only to be canceled afterward because they found it utterly impossible to run the wires.

In view of the present arrangement, I look for a development in electric lighting here which will amount almost to a boom.

The people want the lights, the companies are ready to furnish them, and with the removal of restriction, electric lighting will take a new start and go ahead until Chicago will be one of the best-lighted cities in the country.

The arrangement, as far as it has gone, applies only to the South Side and divides that portion of the city up between three companies, the Western Electric Company, the Badger Company and the Sperry Company. The Western Electric Company have all the territory on the South Side north of Washington street, the Badger Company have the district south of Washington, west of Dearborn and north of Twelfth, and the Sperry Company south of Washington, east of Dearborn and north of Twelfth.

I say that these companies have all the territory in the districts named because they have rented all the manholes which the conduit company now has, or is likely to have very soon, in those districts. I do not mean to say that the arrangement is exclusive (though the three companies have agreed to keep off of each other's territory, I believe), for I suppose if a fourth company should come along and be able to show the conduit company that its business would warrant the putting down of additional conduits, the conduit company would be only too glad to put them down, though it would probably be some time before the work could be got under way.

That an arrangement has been carried through which removes many of the restrictions on electric lighting in Chicago is cause for a good deal of congratulation, and is something which has been hoped for for a good while.

Cheltenham Beach, on Lake Michigan, is to be, when the extensive system of improvement now in progress shall be completed, Chicago's Coney Island. The improvements include an electric light plant of forty lights, six of which will be set on a mast. The Van Depoele Company have secured this part of the contract.

Mr. Fred Degenhardt, late of the Western Electric Company, has engaged with the Standard Underground Cable Company of Pittsburgh, and will hereafter represent them on the road. Mr. Degenhardt carries with him the necessary qualifications for the position.

Mr. Chas. H. Cone takes Mr. Reid's place with the Electrical Supply Company, and has just started out on a trip through the West. Mr. Cone has been connected with the company for some time in another capacity.

The Sperry plant, at State and Washington streets, has been enlarged by the addition of two 20-light machines. The Sperry people have also just closed contracts for three new plants to go further West, details in regard to which will follow.

Mr. E. P. Roberts, superintendent Brush-Swan Electric Company, Cheyenne, Wyo., was a caller at this office last week.

The proverbial "small boy" cropped out again the other day in an interview between a prominent Kansas City business man and a Western Union messenger; and the incident may serve to illustrate the depravity existing among the general run of messenger boys.

The gentleman complained to the boy respecting what he deemed unnecessary delay in the delivery of his telegram. "My boy," he said, "you tell Mr. Wood that my messages must be delivered more promptly, or I will give my service to the Pacific Mutual."

The urchin immediately assumed the independence so characteristic of the corporation in responding, with emphasis on the last word, "Well, sir; Mr. Wood would probably tell you to go to h—l."

THE TELEGRAPH.

Wanting the American Cable System.—The South American Commission has been cordially received at Montevideo. It has been asked to use influence in favor of extending the American cable system to Uruguay. The commission will ask the United States government to exert its influence to this end.

Russian Telegraph Lines.—Russia, recognizing how she was hampered for telegraphic facilities in Asia during the recent Afghan troubles, is now pushing forward her lines toward India. Her telegraphic system has been completed as far as Merv. It is now being extended to Sarakh, on the confines of Afghanistan.

Sunshiny News.—Among other itinerant news items is the statement that the State of New York has refunded to the Western Union Telegraph Company $400,000 for taxes illegally assessed. The actual earnings of the company, they say, exceed the estimates, and the recent declaration of a 1½ per cent. dividend was fully justified by the company's finances.

Southern Telegraph Company.—The Farmers' Loan and Trust Company and R. T. W. Duke, Jr., have procured an injunction from Judge Andrews of the New York Supreme Court, in a suit against the Southern Telegraph Company, restraining J. G. Farnsworth, as receiver of the Bankers & Merchants' Telegraph Company, and Joseph Fettretch as trustee, from selling, transferring or otherwise disposing of the bonds of the Southern Telegraph Company in their hands or under their control.

Municipal Revenue from the Underground Wires.—Mayor Smith, of Philadelphia, in his annual message to councils, says: "In my judgment the city government has so far lost a great opportunity for revenue. The city should have inaugurated a system and laid pipes for its own use and rented to all other telegraph, telephone and electrical lighting companies the right to run their wires through the city pipes; even at a small rental to each company, the revenue would be immense, and the business interests and general convenience to our citizens would be very great. It is not yet too late to begin the plan herein suggested."

Underground Wires in Washington.—Justice Hagner, of the District Supreme Court, has given a powerful impetus to the movement for placing all telegraph wires under ground. The District Commissioners recently compelled the Western Union Company to put its northern wires under ground for about half a mile from its main office, and then permitted them to erect huge poles on Seventh street to the boundary. The property-holders on Seventh street remonstrated, and appealed to the court. Justice Hagner took their side. After a review of the allegations of the bill and the objections of the defendant, he declared that a sufficient case had been presented to warrant the court in granting the relief asked, and directed that a decree be prepared in full accordance with the prayers of the bill.

To be Confined for Contempt.—In the New York Court of Common Pleas on June 12, Judge Daly signed an order in the suit of Hammond & Dodge against the Gold and Stock Telegraph Company, adjudging the defendant company guilty of contempt, and directing that Norvin Green and A. R. Brewer, president and secretary of said company, be confined in Ludlow street jail until the company obeys the order of injunction issued December 29, 1882, and continued March 3, 1885, by restoring the wires and connecting the indicators in the office of plaintiffs with the circuit of the Gold and Stock Telegraph Company. Mr. Stephen D. Law was appointed referee to determine the amount of damages due Hammond & Dodge. Up to to-day Dr. Green and Mr. Brewer had not been incarcerated.

A Dissatisfied Receiver.—Adjutant-General Farnsworth, who is receiver of the Bankers & Merchants' Telegraph Company, says he doubts if receivers are the favored persons that they have been pictured by the press. "I have heard," he said, "of $100,000 being the ordinary total of fees for the receivership of an insurance company. But of all the men who have received such fees or anywhere near such fees I don't know of one that has any money or great amount of property to-day. You see, it costs a man something to be a receiver. I have a friend whose fees as receiver amounted to $30,000. Some of his acquaintances thought it was a 'plum.' But he was five years in earning it. He was a business man, and the neglect of his own business caused a loss of more than that amount, to say nothing of the worry and double amount of trouble. The fees of receivers nowadays are moderate, indeed so moderate that the sooner I can wind up B. & M. affairs and get out of it, the better I will be suited."

Telegraph War at Long Branch.—It is stated that there is every prospect of a lively telegraph war at Long Branch this summer. Heretofore the Western Union Company has had a monopoly of the telegraph business, and it has not been slow in taking advantage of its position. About three weeks ago the Baltimore & Ohio Company quietly began running its wires down from New York, and made arrangements with several hotels to have its instruments placed in their offices, instead of those used by the Western Union. Two general offices were also erected. The first open indications that the Western Union intended to make a fight against the entrance of its opponent were seen a few days ago, when Mr. Rogers, of the United States Hotel, and Mr. Stokes, of the Scarboro, were informed that the Western Union would get out an injunction against them if they permitted any other telegraph company to put its instruments in their hotels, and would hold them responsible for the damages resulting therefrom. The Western Union claims that it has a perpetual lease of the telegraph offices in the hotels, and also the exclusive control of them so long as it desires it. On the other hand, the Baltimore & Ohio people declare that the leases are simply from year to year, and that the hotel men have a right to cancel them whenever they see fit. It is probable that the matter will have to be settled in court, as one or two of the hotels have already arranged for the Baltimore & Ohio service. There is also some talk about a reduction in rates for the service to New York. The present rate is 25 cents for 10 words, and it is said that the Baltimore & Ohio will send the same number for 15 cents.

Preparations in England.—Extensive preparations are being made by the government for the new system of sixpenny telegrams. The extensions have been made on the basis of an estimate that a reduction in tariff will cause an increase of the business of the department to the extent of 30 per cent. within the

first year, and the extra expenditure already incurred amounts to half a million sterling. Of this amount £475,000 has been spent on new plant—poles, wires, instruments, etc.—while £25,000 has been laid out in the erection of new buildings. This comparatively small proportion for the latter purpose is due to the fact that accommodation for future development had already been provided in most of the post-offices built or extended within the last two or three years, including those at London, Manchester, Bradford, York, Exeter and Plymouth, Glasgow and Aberdeen, Cardiff, Dublin, Belfast and Cork. The length of public road upon which new poles have been erected in England is 850 miles, apart from the extension on railway routes, and upon these poles there have been placed 9,200 miles of new wires, in addition to which there are about 11,600 miles of new wires put up on existing road or railway poles. In London, the number of offices at which the pressure of business is met by the use of pneumatic tubes will be increased by the use of an additional length of 7,500 yards of tube. Among the additional instruments purchased are 40 Wheatstone automatic, 8 quadruplex, 300 duplex sounders, 350 single sounders, 150 single needle instruments and 10 extra repeaters. The duplex system will be completed in the case of 100 circuits. The staff throughout the kingdom will be increased to the extent of 1,200 new telegraphists and over 1,000 messengers.

THE TELEPHONE.

Telephones in Mexico.—The Mexican Telephone Company has contracted to furnish the government 25 telephones to connect the tax offices and barracks in the federal district. Private subscribers are continually increasing.

Southern Bell Dividend.—The Southern Bell Telephone Company of New York, controlling the Southern States, has declared a quarterly dividend of 2 per cent., payable July 1. This is an increase fro m 1½ per cent. paid in January and April.

The Wallace Telephone System.—In this system, recently devised, the transmitter consists of a microphone of simple construction, a short rod of carbon weighted, resting on two supports. The receiving instrument differs from those in general use in that no permanent magnet is used. The core is a short piece of soft iron, one end of which is surrounded by a coil of fine wire. In this system, operated by the Wallace Electric Telephone Manufacturing Company, the battery is located at the central office, thus removing it from the subscriber's instrument. This permits of its being used on several lines and reducing the number of batteries required.

Bell Patent Suits.—Judge Wallace has rendered a decision in the United States Circuit Court favorable to the plaintiff, in the suit of the American Bell Company against the Molecular Telephone Company for infringement. An answer to the patent infringement suit of the Bell Telephone Company against the Western Pennsylvania Telephone Company has been filed in the United States Circuit Court, Pittsburgh. The defendants deny the validity of the Bell patent, on the ground tthat he invention was known 15 years before Bell or Edison took out patents by which control of the system is now claimed. It is on this point, however, that Judge Wallace has pronounced for the Bell Company.

Central New York.—At the annual meeting of the Central New York Telephone Company on June 18, the old board of directors was re-elected. At a meeting of the board of directors the following officers were elected: President, R. S. Williams; Secretary and Treasurer, Frank G. Wood; General Manager, Charles A. Nicholson; Superintendent, Thomas P. Nightengale. The reports presented show an encouraging state of affairs. The net earnings for the year were $24,729.62. The company has 14 exchanges in operation, with 1,280 subscribers. It has 247 toll stations and 1,314 miles of toll lines. Lines under contract will unite all parts of the territory and increase the toll stations to 334. The new exchange at Canton, opened April 30, 1885, can be made to pay under the new scale of royalties. The closing of the Baxter exchange at Utica has run the list of subscribers there higher than it ever was before. The company is paying 1½ per cent. quarterly dividends.

Statement of the International.—The International Bell Telephone Company, operating in the principal countries of continental Europe, has declared its first dividend, 2½ per cent., payable July 1 to stock of June 20. In connection with the declaration of a dividend, the International Bell company presents a financial statement which shows that of a capital of 17,000 shares. 3,130 are held in trust to meet $313,000 convertible 6s, and that the debt consists of the above bonds and $238,000 inconvertible 6s. The company has 1,052 paying subscribers in Christiania and Drammen, Norway, 2,531 in Russia, and exchanges of nominal value in Italy, beside stock in sub-companies in Holland, Belgium, etc., of considerable value. The gross receipts in Europe in 1884 were 697,777f., and net receipts 624,649.89f., equal to $120,124. New York and interest expenses reduced this amount to $83,575.14. The business so far this year encourages the president to expect 5 per cent. dividends in 1885. A beginning has been made by paying 2½ per cent., as above.

A Remarkable Decision.—The language of Judge McKennan in the Bell vs. Clay case, puts a strange limitation on the power of U. S. circuit courts. He intimated that he had no "expectation of being guided by the arguments to the formation of any different opinion upon questions which have been involved in other cases of the kind in other circuits." He added: "We feel more and more impressed that there ought to be a uniformity of decisions throughout the Federal courts of the United States in respect to questions affecting interests which stretch all over the country, and are coming up, from time to time, for adjudication in the several circuits throughout the United States. We have felt a stronger pressure upon us every day to conform our own views, where cases have been considered in other circuits which involve the same questions, and which come up for consideration here—to conform our own views to the decisions of the other courts in other States, which have taken lead in the determination of these questions. In so far, therefore, as the validity of this patent is concerned, or has been involved in the cases in other circuits, upon grounds which are before this court, we will adopt the view expressed by the courts in Massachusetts and in New York upon these questions. I do that, as you will understand perfectly, not as indicative of any view of my own, but simply as a matter of conformity to the judgment of courts whose opinions are entitled to respect, and who have undertaken to decide the question involved. And I do that, further, that we may all acquiesce, as we ought to do, in the determination of the Supreme Court, if the cases reach that court. All these questions relative to patents, intricate as they may be, must be remitted to the judgment of the Supreme Court, and it is desirable, until it is thus remitted, until that time does arrive, that we should have a uniformity of opinion and judgment among the judges of the Federal courts throughout the United States. So that, in so far as the questions involved in this case and discussed here have been already passed upon by the Circuit Court of Massachusetts, or by the Circuit Court of New York, you may be relieved from the labor of discussing those questions, because I will follow the decisions made there upon those questions."

THE ELECTRIC LIGHT.

Charlotte, N. C., is to have an electric light plant.

New London, Conn.—The Electric Light Company is putting in a 60 horse-power Westinghouse automatic engine.

Richmond, Va.—The Schuyler Electric Light Co., of Hartford, Conn., have secured the contract to light Richmond, Va., with their electric lights.

Carbons.—The Forest City Carbon Company, of Cleveland, O., has ordered a 130 horse-power engine, outfit complete, from the Cummer Engine Company, of the same city.

Football by Electric Light.—The New York and Toronto Association football clubs played a game by electric light, at Toronto, on the night of the 18th of June, which resulted in favor of the latter by a score of 2 goals to 1.

Sawdust as Fuel.—The Lewiston Electric Light Company, Lewiston, now use saw dust for fuel, costing them only seventy-five cents per cord, delivered. They find this fuel more economical than screenings for making steam.

The College of Ottawa.—Messrs. Ahearn & Soper have just completed the successful installation of a two hundred-light incandescent plant in the College of Ottawa, Ottawa, Ont. This is the first educational institution in Canada to adopt the electric light.

A Fight without Avail.—A contract was signed June 9, between the city of Marshalltown, Ia., and an electric light company, and a bond filed providing for lighting the entire city by twenty electric lamps. The gas company made a strong fight in the council against it.

In a Bank Vault.—One of the banks in New Bedford, Mass., has advantageously given up gas for an incandescent lamp in one of its vaults. An eight-candle power Edison lamp is being run by eight cells of Kauffer's improved battery for six weeks on an average of one hour a day without renewal whatever.

Sawyer-Man vs. Edison.—Messrs. E. N. Dickerson, Amos Broadnax and Hugh R. Garden have been retained as counsel by the Consolidated Electric Light Company to open suit against the Edison Company for alleged infringement of the patent for carbonized fibrous filament granted recently to the company as representing the inventors, after a five years' struggle in the Patent Office.

Effect on Vegetation.—Mr. P. P. Dehérain's conclusions regarding the influence of the electric light on vegetation are the following: (1) The electric light contains rays which are injurious to vegetation; (2) the greater part of these rays are kept back by transparent glass; (3) the electric light contains, on the other hand, sufficient rays useful to vegetation to maintain the life of plants entirely under its influence for two and a half months; (4) this amount of useful rays is, however, insufficient to bring on young germinating plants, or to bring full-grown plants to maturity.

Canadian Consolidation.—The Royal Electric Light Company held a special meeting on Saturday for the purpose of receiving a report of Mr. M. Lee Ross, the general manager, who has returned from New York, after having entered into arrangements with the Edison Electric Light Company for the consolidation of the Royal Electric and the Edison Company systems for the Dominion of Canada. The final arrangements will be concluded by the executive committee in New York next week. Next Wednesday the following committee goes to New York to complete arrangements: Messrs. W. R. Elmenhorst, John Hope, C. F. Sise, and M. Lee Ross.—*Montreal Witness.*

Exactly So.—Speaking of dust explosions, says the *Milling World*, a case from Germany is worthy of notice. A sack of flour, falling downstairs, opened and scattered the contents in a cloud through the lower room, where a burning gas flame set fire to the dust, causing an explosion which lifted a part of the roof of the mill, and broke almost all the windows. There can be no doubt that the majority of dust explosions are, like mine disasters, due to open lights; and as this danger can be practically avoided by the use of the incandescent electric light, there really seems to be no valid reason why it should not be introduced more generally, as those establishments which have used it express themselves in its favor.

Incandescent Street Lighting.—A proposition has been made by the Edison Electric Illuminating Company, of Lawrence, Mass., to furnish that city with as many electric lamps as the number of oil and gas lamps now owned and operated by the city, and twenty-five additional lamps to be placed as directed, the entire care and expense of maintenance to be assumed by the company, who will furnish the current to all the lamps throughout the year during the usual hours of lighting, and to 100 of them the entire night. The poles, wires and other fixtures furnished by the company are to remain its property, and the city is to grant the right of use of such poles as are already set where the rights of others will not be interfered with. The expense to the city under this arrangement will be $650 per month, extra lamps, subsequently ordered, to be furnished pro rata.

Lighting Peru.—Mr. William Widlund, a prominent merchant of Callao, Peru, is now in Boston for the purpose of arranging to introduce the electric light in the eight principal cities of the country—Lima, Callao, Arequipa, Puno, Cuzco, Trujillo, Cajamarca and Puira. Some of these cities have ample water supplies for the purpose of running the dynamos, and this will be duly economized. The Peruvian Electrical Construction and Supply Company has been formed by gentlemen in the neighborhood of Boston for supplying Thomson-Houston plants to Peru. The works of the company at Lynn are now engaged in preparing the plant of 90 arc lights, with dynamos and boilers complete, for Lima, to be followed at short intervals by those for the other cities. In all cases iron lamp posts will be used. The whole of the material for this lighting will go from New England.

In a Famous German City.—It was in 1846 that gas was introduced in Stuttgart, and a number of old women who had been employed by the Town Council to light and trim the ancient oil lamps walked in procession through the streets of the town, bitterly complaining that they had been robbed of their bread and butter by the new invention. The complainants to-day are the directors of the gas companies and their shareholders. But the shouts and yells of the old lamplighters in Stuttgart did no more bring back the ancient oil lamps than the deprecations of directors and shareholders of gas companies will prevent the electric light from ousting gas as a lighting material. And who but they will regret it? All will rejoice at the prospect of living, breathing and working in rooms whose atmosphere is no longer vitiated by products of combustion, such as carbon dioxide, sulphur dioxide and others, and where the temperature is no longer artifically raised by the combustion of eighty-five per cent. of heat-giving gases, contained in ordinary coal gas, which we burn for the sake of its 12.15 per cent. of heavy light-giving hydrocarbons. It was a tempting task, promising a golden harvest, to find a suitable substitute for it; and in no branch of applied electricity has so much ingenuity been displayed as in the construction of the various lamps.—*Fortnightly Review.*

Promising Experiments.—Recent experiments have been made here and elsewhere to enable each incandescent lamp to contain its own battery, and they have succeeded perfectly. This, success has been effected in Europe by Trouvé and by means of the Skrivanoff primary battery, the elements of which consist of a small packet of chloride of silver and two plates of zinc placed in the cell with a weak solution of caustic potash. A small battery is placed in the stand of a moderator or other similar kind of lamp which can thus be utilized for that purpose, a glow-lamp being fixed on the top in place of the ordinary burner. A private demonstration of this invention was lately given at the establishment of Messrs. Blumberg & Co., in London, at which various lamps of the kind indicated were successfully shown in action. One had a battery consisting of three boxes, each measuring only four inches by two inches by one inch, and which supplied the current to a glow-lamp of Italian manufacture, the light being an exceedingly good one. It was stated that it would burn for twelve hours with undiminished brilliancy, but that at the end of that time the silver would have been converted into pure silver and would require to be revivified. This is easily effected by washing it in a solution of nitric and hydrochloric acid. It is then replaced in the battery for further use, there being no waste of the silver. The marked advantages of this system of domestic electric lighting, beyond the portability of the lamps, are the absence of fumes, the small battery capacity, and the great electromotive force, this being 1½ volts for each cell, which is only 1 inch in width. Applied to the arc system, the Skrivanoff battery shows its power, a light of 250 candles being produced from a couple of batteries measuring 10 inches long by 8 inches wide and 6 inches high.

MISCELLANEOUS NOTES.

Voltaic Electricity.—Prof. A. L. Arey has begun before the Buffalo Electrical Society a series of elementary lectures on voltaic electricity.

Lightning Freaks.—During a severe storm in Illinois last week, a thunderbolt, it is said, passed through the window of a house shaded by tall trees and entered the sitting room, where it killed one person, stunned another, affected two others, and left three uninjured.

Underground Commissioners.—Mayor Low of Brooklyn has appointed as commissioners to carry out the provisions of the underground wire law: George W. Plympton, Professor of Chemistry and Electricity in the Polytechnic Institute, Rossiter W. Raymond, and John Reynolds, a lawyer.

The political changes in England may have some effect on the proposed reduction of telegraph rates in England. It was said before the resignation of the Gladstone cabinet that, owing to the troubles caused by opposition to the budget, the Telegraph Acts Amendment Bill would be abandoned. There is now nobody to abandon it, but a new measure may be put forward by the Conservative ministry, embodying the old feature of a reduction of rates.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as ollows:

Telegraph.—Am. Cable, b 60½, a 62; Am. District, b 23, a 26; B. & M., a 3; Postal stock, a ¾; Postal sixes, b 8¼, a 9.

Telephone.—Am. Bell, b 209, a 210; Erie, b 21, a 22; International, b 50; Mexican, b 1⅛; New England, b 33½, a 34½.

The Boston *Herald* says of Bell stock: The legislature will be unable to disturb the even flow of prosperity further until next January, and meanwhile stockholders will look for three per cent. dividends quarterly and a three per cent. extra. The company could pay 4 per cent. quarterly if it desired, and yet add to its working surplus.

Electric Light.—Edison, b 61, a 65.

APPLICATIONS OF POWER.

To Run Elevators.—"We are ready to take a contract to put up elevators for the 'L' stations, to be run by electricity as soon as the electricians begin to run trains by electricity, so as to furnish a current," said a member of the firm of Otis Brothers & Co. last week. "I had a talk with Mr. Field about the matter several weeks ago, and afterward with Col. Hain, general man-

ager of the Manhattan Company, and the Daft Company have inquired about the substitution of electricity for steam in elevated service generally. We have estimates as to the cost, and drawings have been prepared for hydraulic elevators at the 'L' stations at Fourteenth and Twenty-third streets, Sixth avenue line, and for some others, but the use of electricity would require a change. As I said, the first thing to be done is to try the experiment with the electric motors, and then we can furnish the elevators for stations if the electricians and the Manhattan Company wish to order them. At the busy stations there would be a large number of passengers to elevate." There are already elevators in this city run regularly by electric motors.

BUSINESS NOTICES.

Lathes and Tools.—Sebastian, May & Co., 169 and 171 West Second street, Cincinnati, O., have issued a new catalogue of their useful lathes and tools.

Anti-Magnetic Shields for Watches.—These shields, made by Giles, Brother & Co., State and Washington streets, Chicago, are an efficient protection to the works of watches from magnetism, as many testimonials in their possession show. This firm also demagnetize watches that are already affected.

Mr. J. Chester Wilson, of Philadelphia, the general manager of the Clark Insulated Electric Wire Company, was in attendance at the annual meeting of Railway Telegraph Superintendents, at Cleveland, O., on June 17 and 18. His former connection with railway telegraph service must have made the meeting of great interest to him, and we have no doubt he was most cordially welcomed by his many old friends.

J. H. Bunnell & Co.—This busy and enterprising firm has not lost time in availing itself of the opportunities presented in its fine new building, 106 and 108 Liberty street. The July catalogue, just issued, is a remarkably comprehensive publication of no fewer than 160 pages, whose contents show that the firm is prepared to do business in every department of electrical application. The list of telegraph instruments, supplies, materials and tools is greatly extended, and it would be hard to mention an article that is not classified, with full information, and very low prices. Special note is also merited by the measurement sets, the batteries, switches, and other apparatus requisite for all classes of work. Wires of every character are enumerated, and the best known cables are all quoted. One portion of the catalogue is devoted to medical batteries, and another to annunciators and electric bells, push buttons, door pulls, letter boxes, gas lighters and the like. Electric lighting receives no small share of attention, data and illustrations being given as regards both arc and incandescent systems, so that the purchaser can tell the cost of the lamps or plants he may want. The scope of this new catalogue may be inferred when we state that it contains 40 pages of matter more than the issue of a year ago; and it is also worthy of remark that many of the improvements and novelties to which attention is drawn are the manufacture of the firm, which fairly claims that its long experience and ample facilities enable it to meet most advantageously the demands of the electrical public.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JUNE 9, 1885.

Insulator; George M. Broomhall, Paterson, N. J 319,447

There are two grooves and perforations in said grooves so as to provide an insulator of such new construction as to remove the danger of the insulators being broken by the ordinary usage to which insulators are subjected, as well as assaults from stones and shot thrown from the guns of hunters.

Circuit Closer for Primary Electric Clocks; William F. Weisgerber, New York, N. Y..... 319,534

This invention relates to a device for automatically closing an electric circuit at the end of every minute and also at the end of every hour, said circuit or circuits being immediately broken again, so that no battery-power is wasted.

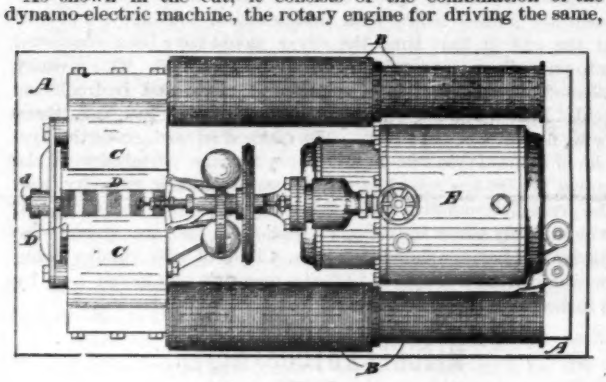
On the circumference of a disc rests a dog, which is secured to the inner end of a lever, the fulcrum of which is on a pivot secured in the frame, and which is so balanced that the dog bears upon the disc and drops into the notch by its own gravity whenever it has a chance to do so.

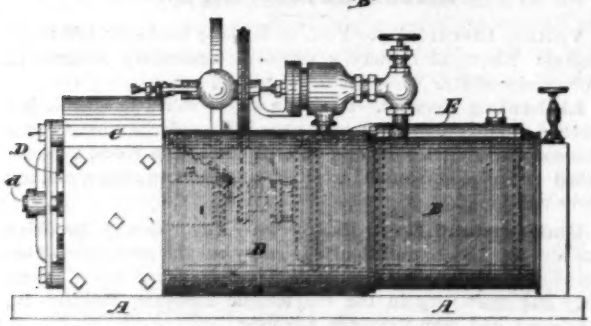
Electric Arc Lamp; Leonidas G. Woolley, Indianapolis, Ind., Assignor to the Woolley Locomotive Electric Headlight Co., of same place..... 319,539

Consists in interposing between the frame on which the mechanism for governing the movement of the carbons is mounted and the dash-pot, a lever, by which the movement of the piston of the dash-pot is multiplied, and thus rendered more effective.

Dynamo-Electric Machine; Leonidas G. Woolley, Indianapolis, Ind., assignor to the Woolley Locomotive Electric Headlight Co., of same place..... 319,540

As shown in the cut, it consists of the combination of the dynamo-electric machine, the rotary engine for driving the same,





319,540. DYNAMO-ELECTRIC MACHINE.

a common shaft for the engine and the armature of the dynamo, and a common bed upon which said engine and said dynamo are both mounted, said engine being located between the limbs or coils of said dynamo.

Dynamo Electric Machine; George A. Hamilton, New York, N. Y., Assignor to the Western Union Telegraph Co., of same place..... 319,578

The general features are shown in the accompanying cut.

This invention is particularly designed to enable a single dynamo-machine armature to feed many independent telegraph-lines each of a different resistance from the others, and to therefore enable the procurement of currents of a strength proportionate to the resistance of the lines to be fed. From the same machine different strengths of current of either polarity are procured. From a line-brush in one position of adjustment only a weak current may be obtained, while, from one in a different position, any intermediate strength of current up to the maximum that the machine is capable of developing can be obtained.

Incandescent Electric Lamp; Louis Heinze, Newark, N. J..... 319,580

Consists of an evacuated glass bulb, and of a light-giving part that is made of helical shape, and connected at the enlarged upper and lower terminals to the conducting-wires.

Torpedo-Boat Propelled and Steered by Electricity; Winfield S. Sims, Newark, N. J..... 319,633

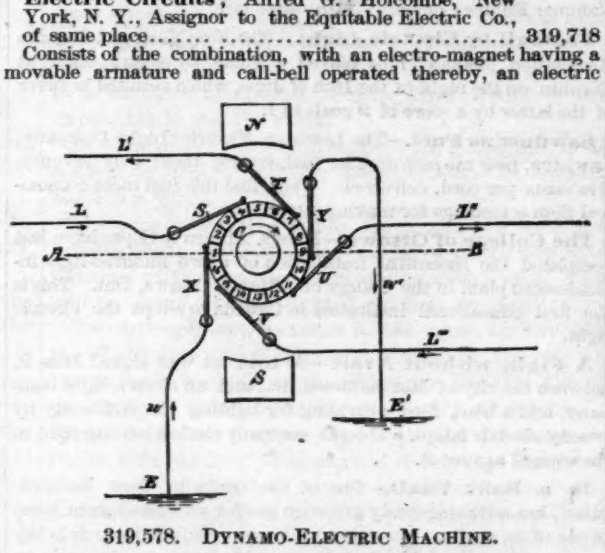
Consists of the combination, with the described torpedo-boat, provided with a screw propeller and an electromotor therein, connected to said propeller so as to communicate motion thereto, of a generator of electricity located outside of said boat and electrically connected by a suitable conductor with said electric motor, arranged in said boat to be paid out therefrom as the boat moves from the generator, whereby the force employed as the propelling power may be derived from electricity generated outside of said boat and applied to actuate said propelling electric motor within said boat.

Automatic Cut-Off for Batteries; Leon Soulière, Chicago, Ill., assignor by mesne assignment of one-half to William Reetz, of same place..... 319,635

1. In an open circuit battery, a rod or arm of non-conducting material is secured at one end and free at the other for holding one section or portion of the circuit in contact with another until weakened or rendered flexible by heat.

Automatic Responding Instruments for Electric Circuits; Alfred G. Holcombe, New York, N. Y., Assignor to the Equitable Electric Co., of same place..... 319,718

Consists of the combination, with an electro-magnet having a movable armature and call-bell operated thereby, an electric



319,578. DYNAMO-ELECTRIC MACHINE.

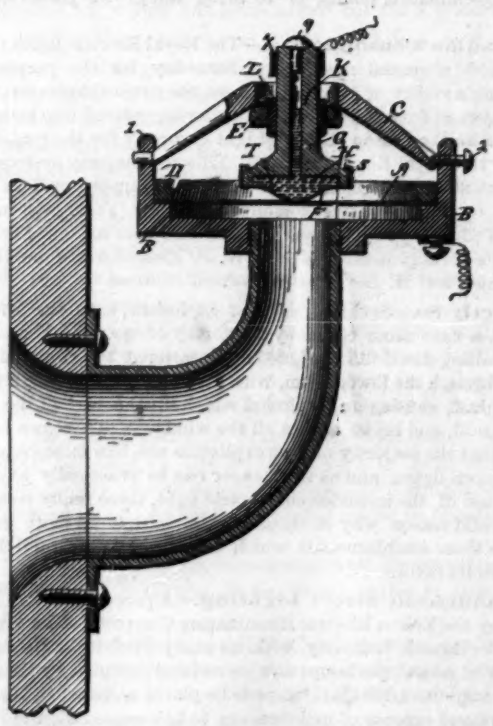
circuit, and means for operating the call-bell from a distant station, of a responding-instrument in a local circuit at the same station, the signaling mechanism of which is released free to act by the armature of the call-bell when the call-bell is actuated.

Electric Arc Lamp; Henri Pieper, fils, Liege, Belgium..... 319,745

Consists in a carbon-feeding device substantially comprising two resilient frictional pawls, actuated through the agency of the electric current, one of the said pawls operating to feed the movable carbon in the measure required toward the stationary one, the other pawl serving to check and retain the movable carbon during the retrograde motion of the feeding-pawl, the carbon being thus continuously kept under control by the pawls and prevented, in case it is arranged vertically, from being acted upon by gravity independently of the pawls.

Paper Guard for Printing Telegraphs; Carl Winkel, Williamsburgh, Assignor of one-half to Levi A. Ludwig, New York, N. Y..... 319,770

Consists in employing, in connection with a blade, two arms or pins which extend in directions approximately tangential to the peripheries of the respective type-wheels and lie in the planes



319,927. TELEPHONE TRANSMITTER.

thereof. The blade is located midway between the two wheels and the edge which is presented toward the printing platen is curved inward slightly. The blade does not project beyond the peripheries of the type-wheels at the point opposite the platen, but at either side of the same it does. The pins project nearly to the points where the platen strikes the wheel, but are sufficiently distant therefrom to permit the operation of the platen to be unimpeded.

Electric Arc Lamp, August Bossard, New York, N. Y..... 319,781

The shunt-magnet has a peculiarly-organized sectional core, one section being adjustable with relation to the other, so as to compensate for the varying conditions of the current.

Electrical Programme Signal; Rufus B. Carr, Boston, Mass..... 319,782

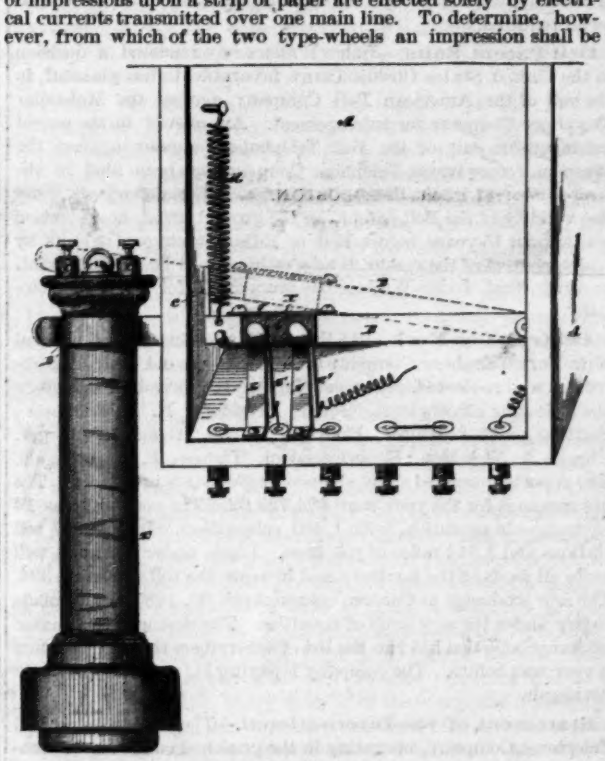
The invention relates to a system of electric signaling by which signals may be given in a definite order and at predetermined times; and it consists in a series of commutators and connections through the same, and appropriate switch-boards, and a mechanically-impelled motor governed, preferably, by a clock and itself so actuating said commutators that, by the co-operation of two or more of the commutators, a bell or other signal may be operated at times governed by the location of the connecting devices in said switch-boards. Devices are also added for automatically varying the programme on certain days of the week, or, indeed, at any time.

Telephone Switch; Henry W. Comstock, Red Oak, Iowa..... 319,789

The accompanying cut represents the construction. It is the object of the improvement to keep bright and fresh all the circuit-closing contacts, so that the currents will flow freely whenever the circuits are closed for the purpose of using the apparatus.

Printing Telegraph; George B. Scott, Brooklyn, N. Y., Assignor to the Western Union Telegraph Co., New York, N. Y..... 319,855

The controlling of the rotation of the type-wheels and the taking of impressions upon a strip of paper are effected solely by electrical currents transmitted over one main line. To determine, however, from which of the two type-wheels an impression shall be



319,789. TELEPHONE SWITCH.

taken, a second and independent main line, burdened with no other condition of operation, is employed. The second line includes at each instrument, preferably, a neutral electro-magnet which serves to shift the press-pad from one side to the other under either type-wheel at the will of the transmitting operator.

Telephone Exchange System and Apparatus; Frank Shaw, New York, N. Y., and William A. Childs, Englewood, N. J..... 319,856

One feature consists in giving to subscribers' lines that are represented upon a switch-board or section of board two switch terminals, one of said terminals being readily movable, while the other is preferably fixed, and is adapted for connection with the first, thereby permitting one subscriber's line to be connected with another by simply bringing the movable terminal of the subscriber calling into connection with the fixed terminal of the subscriber called for.

Electric Engine; William A. J. Kohrn, San Francisco, Cal..... 319,912

The reciprocation motion of armatures which are connected to a crank, is converted into rotary motion. The magnets are placed end to end.

Electric Battery; M. Jervis Meyers, Syracuse, N. Y.. 319,923

The purpose of the invention is to prevent the evaporation of the exciting-liquid of the battery; and to that end the invention consists in the novel construction of an elastic packing-ring embracing the cell and zinc electrode, and fitted closely to the interior of the open end and spout of the cell.

Telephone Transmitter; S. Prentiss Nutt, Natchez, Mississippi..... 319,927

As shown in the cut, it consists, first, in a new form of variable rheostat. A conducting-liquid constituting a fluid electrode is employed. It is placed in a chamber whose dimensions are variable under the action (direct or indirect) of the sound-waves. A tube communicates with this chamber, so that the liquid, according to the pressure exerted on it in said chamber, will rise and fall in said tube. An opposing electrode makes contact with the liquid in the tube, the rise and fall of which liquid produce vibrations in the resistance of the rheostat. There are also suitable conductors for including the two electrodes in circuit.